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November 22, 1923

# Engineering News-Record

*In this issue:*

Staff Report of American Society for Municipal Improvements Convention

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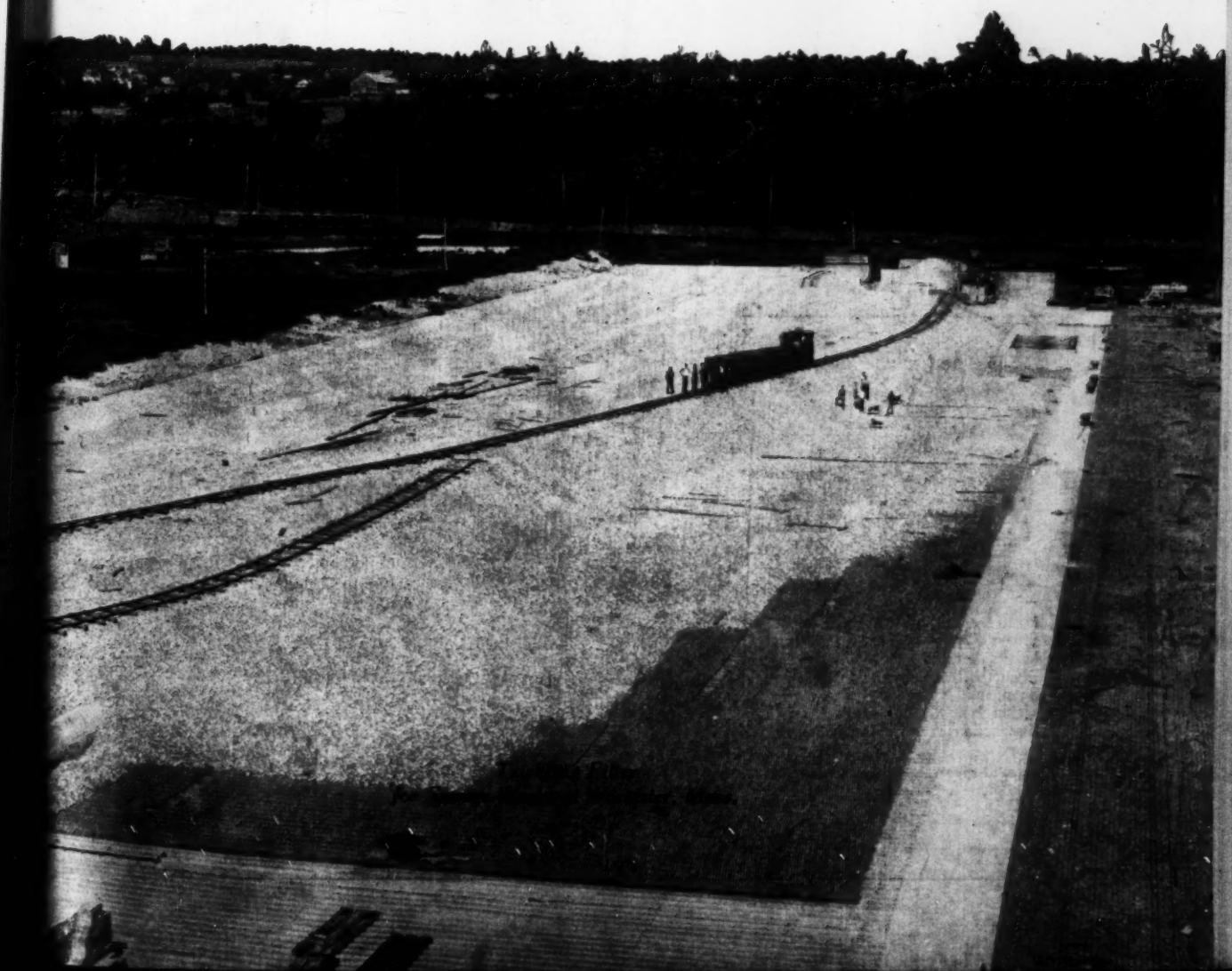
City Forces Build Sewage Treatment Works
By Earl R. Perry

Composite Foundations for Large Temple Building

After Reclamation, Organized Land Settlement
By George C. Kreutzer
Superintendent, State Land Settlement, Durham, Calif.

This is the fifth article in the series on federal land reclamation



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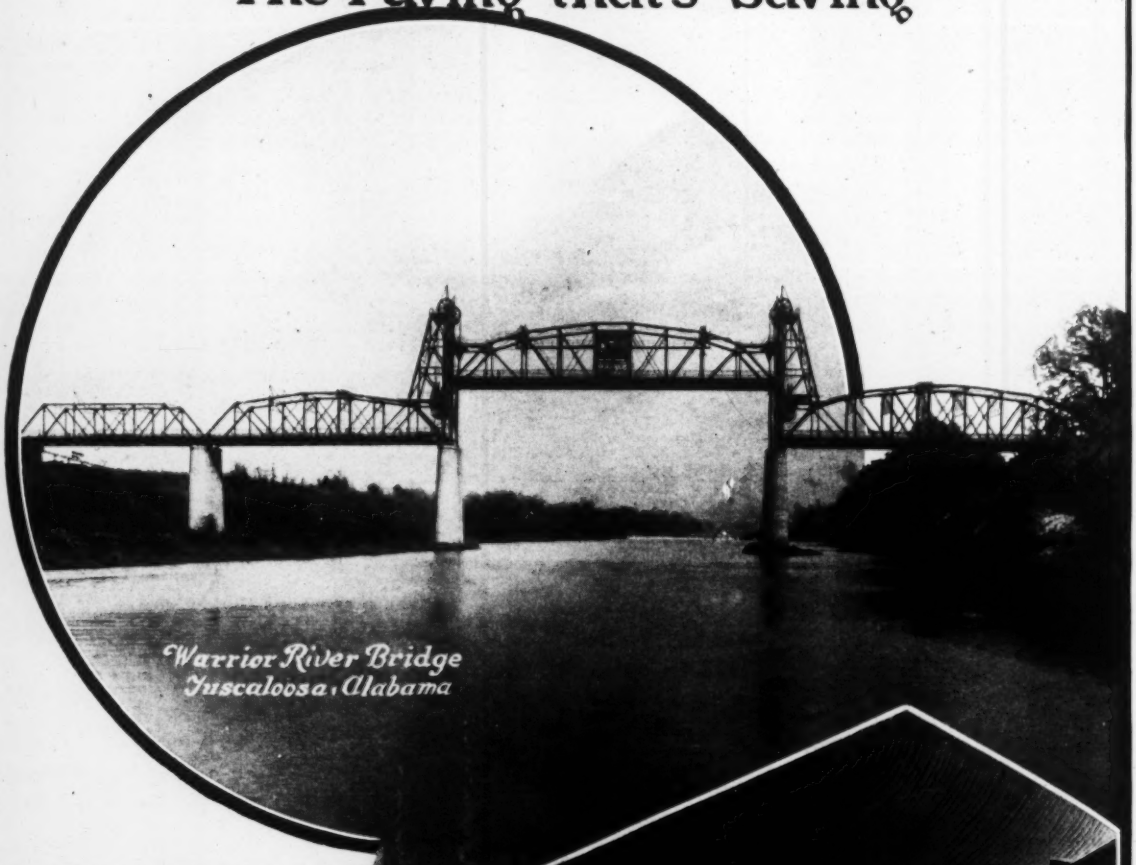


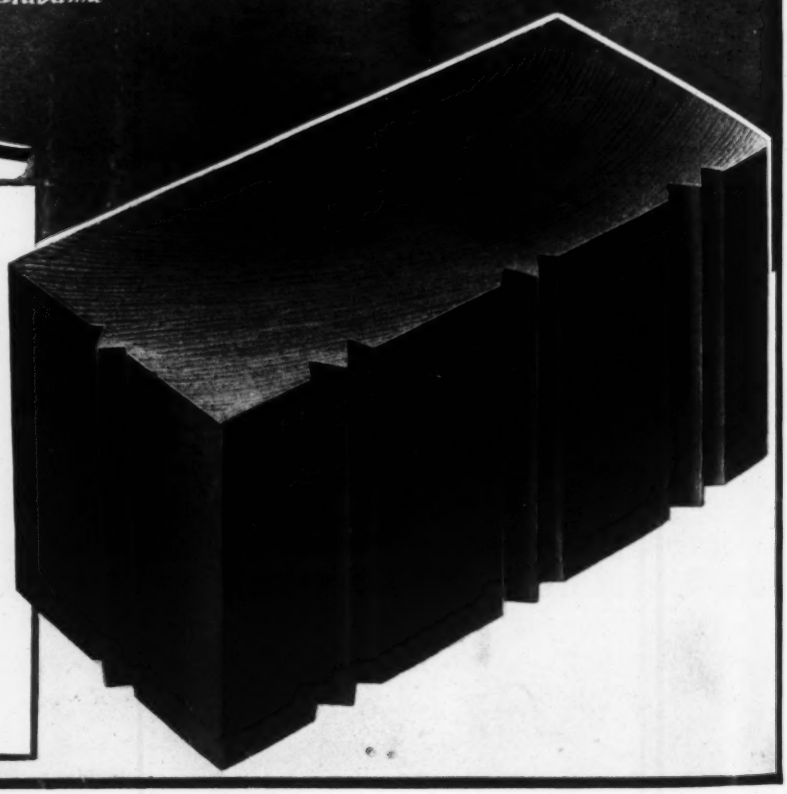

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# ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. MEHREN, *Editor*
FRANK C. WIGHT, *Managing Editor*

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## Paying for the Coal Reserves

PART of the mounting cost of anthracite coal is made up of interest on the ever-increasing capitalized value of the coal lands held in reserve for future use, according to the latest report of the Coal Commission. This has got to stop sometime if the price of coal is to be kept within reasonable bounds. As the supply of coal is depleted the value of the remaining coal lands will increase and if the owners of these lands are to be allowed to keep on increasing the capitalized value of these lands the interest on this capitalized value which now makes up part of the cost of the coal being mined will increase correspondingly until the cost of coal becomes prohibitive. Just how such coal lands are to be valued is not an easy question to answer for to hold exactly to the original cost value would work an injustice to the coal companies who bought their lands years ago for little or nothing but who held them through the losses of pioneer days. Yet there is still greater injustice in the method of enhancing values such as was used when the stockholders of the Delaware, Lackawanna and Western R. R., when separating the railroad from the coal business, sold their coal properties, valued at $6,240,000, to themselves as stockholders in the Alden Coal Co. for $72,240,000. We can think of no better way to hasten nationalization than a few more such exhibitions of capitalizing monopoly property possession.

## Valuing Monopolies

THIS whole matter of capitalizing the unearned increment due to monopoly control is in for serious consideration in the next generation. One does not need to have radical or "red" tendencies to see the difference between profiting in the rising value in land in a city or in a wheat growing country and the same kind of profiting in coal lands, or possibly as time goes on in oil lands and even water power. There is nothing that compels people for all time to do business near the corner of Broad and Wall St. in New York. When rents become prohibitive there the prospective lessee moves elsewhere where the leasing cost is low enough to enable him to operate at a profit. Coal, on the contrary, is a disappearing necessity and the undisputed possessor of as much of it as remained would in time have the rest of the country in his complete power. Obviously nothing like that is going to be permitted but the difficulty is going to lie in determining where monopoly ownership shall be permitted to stop. There is a sufficient analogy in the matter of water power to give all power people pause. Is it possible that some of the public resentment against private power interests is due to the fear that as water power becomes more and more a necessity the valuation of water rights will be correspondingly increased to a point where a fair return on such monopoly value becomes outrageous?

## An Arbitration Court

ARBITRATION proceeds apace in the construction industry. The New York Building Congress has adapted an arbitration clause whose inclusion in all building contracts is advised and which has features not common in such contract provisions:

> All disputes arising in connection with this contract shall be submitted to and determined by arbitration, as provided in the arbitraton law of the state of New York, in a Tribunal of Justice to be known as the Court of Arbitration of the New York Building Congress, to be established and conducted by the New York Building Congress (Arbitration Committee), under the rules of procedure as set down by the Arbitration Society of America as of Sept. 1, 1923.

It will be observed that provision of the machinery for conducting arbitration cases is indicated This consists of the selection by the Building Congress of half a hundred men competent to act as arbitrators and the services of its Arbitration Committee to arrange place and time of meeting and establish rules and methods of procedure in conformity with the arbitration law of New York. In brief a Court of Arbitration is established. This is constructive action well in advance of most of similar contract arbitration plans.

## Floods and Waterway Transportation

COLONEL ASHBURN'S report on the government's Mississippi River freight service, noted in the news pages, is an excellent defence of the waterway as a freight carrier but it contains, inadvertently perhaps, the best possible explanation of the continuing disability of the Mississippi to compete with its paralleling railways. During the spring and summer of 1922 the great river was in flood, so that for a month or more navigation was dangerous and freight landing on nearly overtopped levees impossible, while for a succeeding half year the channel, twisted and shifted by the record flow, was either unmarked or impassable. In consequence tonnage carried, which had been approaching a paying basis, fell so low that only an enormous surplus or the resources of the government could have saved any shipping line from bankruptcy. The director of the service rather intimates that this could have been avoided had proper engineering control of the channel been exercised and accepts the disaster of 1922 as something which could be avoided in the future. This is a doubtful attitude. The Mississippi will continue to have floods, so long as rain continues to fall in the valley, and those floods will continue to warp and wreck an already tortuous channel. No engineering control within the bounds of financial possibility can prevent it. Any operation of freight service on the river, therefore, must count on recurring periods of long disuse, or at best difficult use, with loss of profit during those periods, as well as the loss of favor which a discontinuous service entails. And this is a heavy impost for any commercial enterprise to carry.

### Art and Craftsmanship

VERY recently someone remarked in a discussion of highway bridge specifications before the American Society of Civil Engineers how noteworthy it is that three separate "standards" for such specifications should be simultaneously under consideration. Not only the society but also the American Railway Engineering Association and the Association of State Highway Officials have drafted such standards, each intended to become established as the universal rule of good bridge building. For many years we have had specifications, expressing the preferred practice of this or that engineer, but present specifications are the direct antithesis of the old ones, since they represent not an expression of individual engineering judgment but its elimination in favor of unvarying uniform practice. The spirit of the past was to make bridge practice good by enlisting the best and freest engineering judgment; the new spirit is to prevent the exercise of such judgment and if feasible enforce uniformity for the sake of good bridges. The situation is indeed significant. Let the reader picture to himself an attempt to draw up standards for arch dams, or for sewage disposal tanks, or for harbors, anything that is recognized as a subject of true engineering activity. Such an attempt is an evident impossibility; any standard for even temporary use would be a statement of the problem only, not of the method or nature of its engineering solution. Were it possible to write standard rules for the engineering solution, it would mean that the subject in question had become so routinized as to be removed from the field of engineering and be relegated to the domain of craftsmanship. Thorough training in calculation may be required to lay out rivets under an algebraic rule of spacing, yet the process will still be craftsman routine. The deciding issue is whether scope is left for the exercise of judgment and ingenuity in meeting the demands of the service which the structure is to meet. If upon answering this question it is found that steel highway bridge construction has indeed passed out of the realm of the engineer into that of the artisan, then the engineering profession has reached the close of the book in one line of its great endeavor of making the teachings of science subservient to the needs of a practical art.

### Highway Bridge Troubles

REFERENCE to the experience records of highway bridges for the past year or two brings out a point that bears somewhat on the question of design rules, discussed just above. Very few accidents have been reported which could be charged to bad proportioning or detailing of the steel construction. On the other hand, many accidents are found to have been caused by conditions unrelated to steel practice. Speaking in approximate terms, once a week a bridge has been reported wrecked by a colliding vehicle which struck the end posts, or pushed the structure off its seat, or tore out a web member. Once a month—again approximating—a failure resulted from a bridge being too narrow for safe passage of vehicles or being so located with respect to the approaches that entrance of vehicles was unduly difficult (and therefore in the long run hazardous). It would seem that in so far as it is the bridge engineer's business to build safe bridges, he has primary concern with matters that lie beyond rivet spacing or permissible width of cover plates. Sound principles of highway bridge construction undoubtedly include among other things certain principles of safe location, layout, and guarding. However, it is not customary to treat of these matters in bridge specifications, and they are not included in the three standards which are now being discussed. Perhaps such specifications are not meant to be guides to good bridge construction. If so, some misconceptions would be avoided by labeling them accordingly; every one should be permitted to know, as bridge engineers know, that not every bridge meeting the standard specifications is a good bridge, and that good bridges may be built which do not satisfy the specifications. If the limited character of the current standard specifications were clearly noted, it might have the result that good bridge construction in its broadest aspects would find a place in technical discussion.

## Lessons from Paris Rufuse Disposal

WHEN the private company which disposes of the mixed garbage and other refuse of the city of Paris completes its improvements and extensions to its disposal plants, Paris will have what promises to be the most complete system of refuse collection and disposal of any large city in the world.

Under this plan, which is outlined at length elsewhere in this issue by the technical director or managing engineer for the disposal company, the mixed refuse is collected by hundreds of motor trucks, owned by private companies and driven by chaffeurs provided by the company but directed and loaded by the city. These trucks deliver the refuse to four disposal plants where, by means of sorting, screening and grinding, all the material of commercial value is reclaimed for utilization. The residue goes to furnaces which yield still further by-products—heat, which is converted into steam and thence into electric current, and clinker, which is made into brick. The city seems to exercise such a complete control of refuse collection as will enable it to insure good service, while the disposal contract seems on the one hand to guarantee a fair profit to the contractor and on the other to be well designed to give the city a share in any excess over fair profit.

All the data at hand indicate that the Paris plan is worthy of careful study by cities and by engineers concerned with garbage and refuse disposal, in whatever country located. By this we do not mean to advocate mixed as against separate collection and disposal of city wastes, nor sorting, screening, and incineration against any other method of final disposal, nor, least of all, do we mean to advocate private rather than public agencies for collection and disposal of municipal refuse. What we do urge is the same careful attention by other municipalities as seems to have been given by Paris to working out a system of refuse collection and disposal adapted to local conditions, which, if private agencies are employed, will protect them against undue risk, while at the same time giving the city some share in the profits, if any, from utilizing municipal wastes, all to the end that the net combined cost of refuse collection and disposal, which is bound to be considerable in any case, may be cut to the lowest figure compatible with good service.

Paris affords a notable example of the change in the incineration of mixed refuse that has been going on abroad of late—in part led by Paris. In that city and in a rapidly growing number of British towns, the entire collection of mixed refuse does not go to the

incinerator. Instead, all material of commercial value is salvaged; paper, etc., for sale, garbage and fine ash to go to land for its fertilizer value and for the physical improvement of the soil. In particular, it is to be noted that by eliminating ashes and as much as may be of other incombustible waste, the calorific value, pound for pound, of what goes to the furnaces is greatly increased, while the furnace output, for re-handling and final disposal, is not only much decreased, but what does remain is almost wholly a clinker—useful abroad, whether or not it would be in America, for making brick or concrete. It should be noted also that all this applies to mixed refuse only and not to furnaces for burning garbage alone or garbage mixed chiefly with paper, tin cans, bottles and the like, as is the case in so many American municipalities that have attempted incineration.

In conclusion, it is well to remember that although a considerable number of American cities have installed equipment to utilize the heat generated by burning city refuse, but rarely has any of the heat generated been used except at the disposal plant, if even there. Under existing conditions, there seems, if anything, less chance of heat utilization in this country than there has been in the past. This makes all the more interesting and important the results that may be achieved at Paris when the enlarged plant and new scheme are in complete operation. It is hoped that careful records will be kept and will be made available.

## A "Business Administration"

BUSINESS principles are to govern the administration of federal reclamation henceforth, said the Secretary of the Interior as he discharged Arthur P. Davis. No more engineers, but business men instead, and the business type of management! Accounts have just come from the far West that detail the first item of this improved management, as carried out in this instance by the Secretary himself—the "business man" upon whom the country is compelled to depend at the moment for the guardianship of our national investment in reclamation projects.

Each of the score or more reclamation projects is a large-scale business undertaking, in which an investment of many millions of dollars must be cared for and an annual business of four or five million dollars administered. The machine by which such a business is handled is of necessity a carefully organized mechanism, as certain to be damaged by unskilled tinkering as a watch. Yet the Secretary has ordered the summary disruption of one of these operating mechanisms, on no better basis than the wanton and ignorant recommendations of an "inspector" qualified for the examination of reclamation projects by a long career as a political henchman. What is more, the Secretary in issuing this order went over the heads of the two officials who are in direct charge of the management of projects and answerable for their proper organization and sound management.

Somewhat more in detail. Since early summer the way has been prepared for improved reclamation management by visits of several sets of inspectors to the projects. The merit of certain of these inspectors consisted in their having no knowledge of reclamation but an intimate knowledge of politics. One of them, a hanger-on of New Mexico party politics and appointed to a position in the Interior Department by A. B. Fall of that state when he was secretary, more especially engaged the confidence of Secretary Work. The activities of this "inspector" while on his visit to the projects seem to have consisted largely in stirring up trouble among the farmers. It may as a matter of charity be assumed that the Secretary has not been advised of the proceedings of this inspector on the projects, but his procedure in blindly adopting the mischievous and destructive recommendations of the inspector can hardly be covered with the same mantle of charity.

Reports which we have obtained of the inspector's doings at the Newlands project, in Nevada, join in showing the following. He collected groups of malcontent farmers and townsmen in Fallon, the chief city of the project, invited complaints, and promised, on the part of the Secretary, any concessions that might be asked for. Specifically in response to some of the complaints he promised that various persons would be paid for canal rights-of-way, unconcerned about the fact that this subject had already been covered by agreements and deeds arranged for by the project organization. He further induced the malcontent water users to appoint a committee to draw up complaints, and led them to prepare silly resolutions condemning "the unjust and discriminatory freight rates paid by the settlers" and holding "the Reclamation Service with their vast influence criminally negligent in permitting this injustice." After engaging in a fight with the Reclamation Service's gate tender at Lake Tahoe (a local paper says, while the inspector was drunk) he reported that this man should be dismissed and that half a dozen other dismissals and shifts should be made in the operating staff of the project. Innocent of experience in project operation, he decided upon recommending the disruption of the project organization built up by the project manager, a man of exceptional ability and long experience in this difficult and responsible work.

Secretary Work's action on this report was to adopt the inspector's recommendations in bulk, over the heads of both the reclamation commissioner and the chief engineer. Under date of Aug. 28, Secretary Work, by letter, directed Commissioner D. W. Davis to have carried out at once the recommendations of the inspector as follows:

(1) To discharge the purchasing agent, his work to be performed by the chief clerk, "who should have the stenographer write his letters; or, when everybody else is busy, should type his own orders, etc."; (2) to use a neostyle in making up forms and papers, (a duplicating machine was already in use in the project office); (3) to discharge the office engineer, his work to be divided between the project manager and several of the field engineers; (4) to designate the chief clerk as acting project manager in the absence of the project manager; (5) to discharge the gate tender at Lake Tahoe, and endeavor to secure a local resident to perform his duties, "the position to be filled by a man whose comportment and behavior will avoid criticism of the department"; (6) to discharge the water master, and have the superintendent of irrigation perform his dutes; (7) to discharge the master mechanic, and have the engineer of drainage perform his duties.

Neglect and mishandling are sure to result from disrupted organization and the destruction of morale resulting from this type of "business" management. Whoever has the interests of the reclamation projects at heart will look with anxious hope to the assembling of a new Congress and to the possible awakening of the President to the activities of the spoiler who represents him at the head of the Interior Department.

# City Forces Build Sewage Treatment Works

## Remarkable Construction Plant Installed by Sewer Department of Worcester, Mass., for Force Account Construction of Imhoff Tanks and Trickling Filter

By Earl R. Perry
Superintendent of Construction, Worcester, Mass.

NOTABLE construction characterizes the new sewage treatment works at Worcester, Mass. One of the largest Imhoff-tank and trickling-filter installations of the world is being put through successfully by day labor. The operation is very nearly self-contained; all materials are produced on the job except cement, lumber and the metal elements of the structures. All major equipment, even the 32x40-in. jaw crusher, is electrically operated. Minor features are form erection practically without falsework, cement-gun fabrication of thin slope walls of sedimentation chambers and winter concreting of heavy walls.

Explanation of each of these outstanding features is more appropriately made elsewhere except in the case of force account work. This followed from the fact that the work was for Worcester. With the exception of buildings, the construction work of this city has always been done by its various departments. Therefore, when the treatment plant came to the point of construction the Sewer Department was instructed to undertake the work. With a portion of its personnel as a nucleus, a working organization of between 200 and 300 men was developed. Heading this organization are David M. Earle, city engineer; Ralph G. Lingley, superintendent, Sewer Department; and Earl R. Perry, superintendent of construction. Doing the work by day labor has been as rapid as and certainly no more expensive than contract construction. It is noted that only construction is considered in this article as follows: (1) structures, (2) plant, and (3) methods.

*Structures*—A map of the land owned by the city for sewage treatment purposes is shown by Fig. 1. Because its topography conformed fairly well to the requirements, the area just south of the present sewage filter beds was selected as the site of the new works which comprise primarily Imhoff tanks, dosing tanks, trickling filter and secondary tanks. This location, however, necessitated, as indicated on the map, the extension, for about a mile, of the 72-in. outfall sewer. About 1,500 ft. of this extension is inverted siphon across swamp; the maximum head is 26 ft. and there are blowoff valves for drainage. The new sewer will have a capacity of 66 m.g.d. To increase the fall through the treatment units the channel of the river below the works was diverted as indicated on the map.

The structures on the sewer line are a Venturi meter and a grit chamber. The grit chamber, having two compartments with coarse bar screens, is located just above the point where the sewage will enter the siphon.

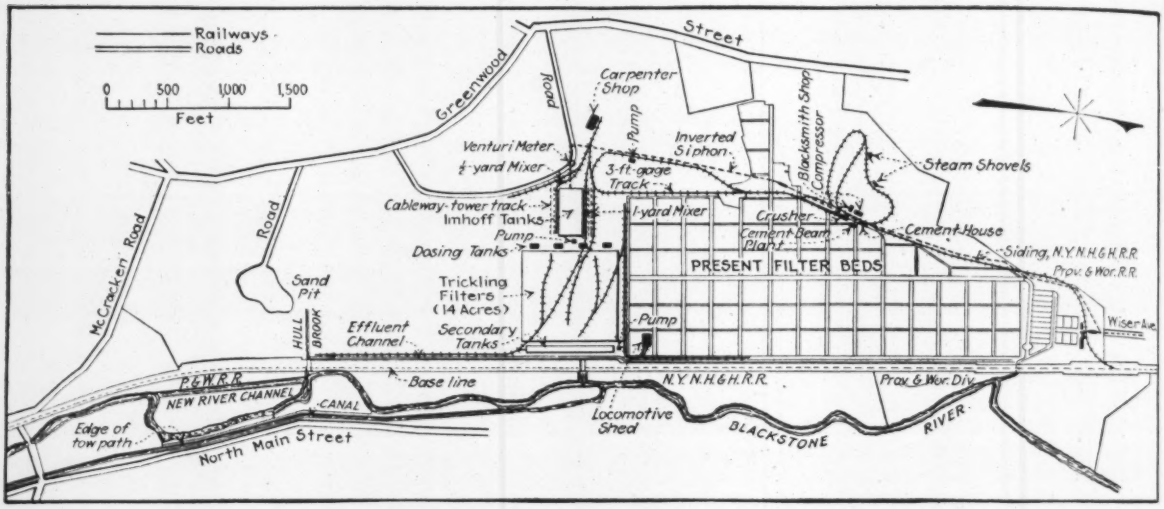



FIG. 1—CONSTRUCTION PLANT AND SERVICE RAILWAY LOCATION MAP

It has sufficient cross-sectional area to reduce the velocity of the sewage from 3.8 ft. to 1 ft. a second. The two compartments will hold 100 cu.yd. of grit and will be cleaned by means of a clamshell bucket. As indicated by the map the 72x30-in. Venturi meter is located between the siphon and the Imhoff tanks.

In the Imhoff-tank unit there are two batteries of six tanks of the double type. The main influent and effluent channels separate the two sets of six tanks. One of the tanks is shown by Fig. 2, which indicates the general structure and the arrangement of the channels, which are all open and provided with gates for controlling and reversing the flow. The twelve tanks are designed to care for a daily flow of 28 m.g., or the sewage of an estimated population of 243,000 in 1934.

Each double tank, Fig. 2, is 61x90 ft. in plan and has a total depth of 33 ft. The tanks have a freeboard of 2 ft., a gas vent area of 21 per cent, and a detention period of 2½ hours. There are four sedimentation chambers in each tank with slopes 1½ to 1 and a total capacity of 240,300 gal. or 32,040 cu.ft. The sludge

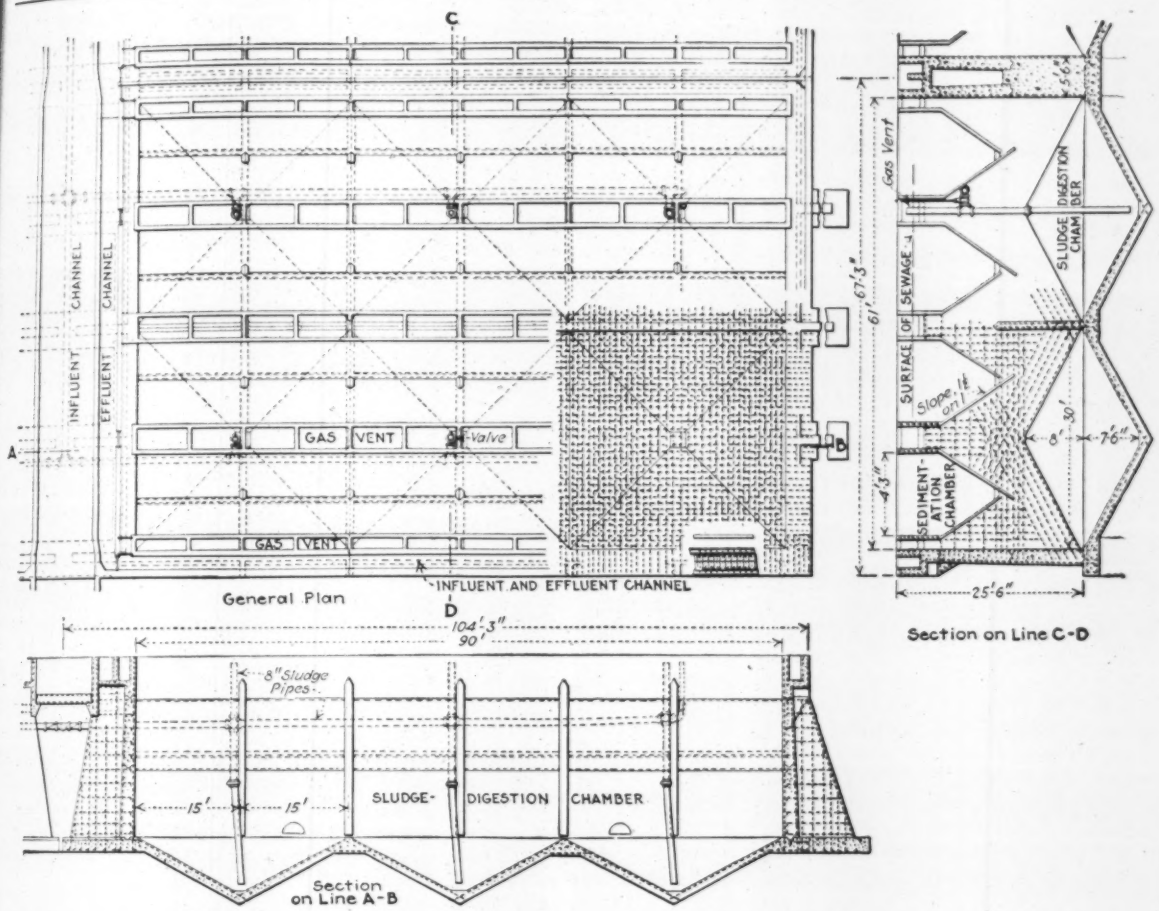



FIG. 2—DETAILS OF IMHOFF TANK—ONE OF TWELVE UNITS

chamber in each tank has a capacity of 70,200 cu.ft. and is provided with six hoppers from each of which sludge may be drawn through an 8-in. cast-iron pipe. The sludge will be dried on sand beds, a portion of the present sand filtration area being used for this purpose. Each hopper is an inverted pyramid 30 ft. square and has 1 on 2 slopes. Perforated water pipes will be placed on each slope for the agitation of the sludge.

The effluent from the Imhoff tanks flows into four pairs of dosing tanks discharged intermittently upon the trickling filter. The time of discharge will be three minutes. The trickling filter has an area of 14 acres and a depth of 10 ft. Distribution of the tank effluent is accomplished by 2,940 full nozzles and 60 half nozzles of the Worcester type. These nozzles discharge under a variable effective head of 7 ft. to 1 ft. and are spaced 15 ft. apart. There are seven inspection galleries in the filter, four of which have inverts acting as main collecting drains. Precast cement mortar beams set on sills form a grid floor having an air space of 43 per cent. A detail of this floor construction is shown by Fig. 3.

Four secondary tanks, each 60x120 ft. and 15 ft. deep, have a detention period of 1½ hours and a total capacity of 1,750,000 gal. These tanks will have hopper bottoms similar in design to those of the Imhoff tanks. An effluent channel 2,500 ft. long conveys the final effluent to the Blackstone River. A laboratory building will be erected at a point near the Venturi meter and be fully equipped to make regular analyses.

*Plant*—Decision to utilize local sand and stone required a large installation of plant. The map, Fig. 1, shows its arrangement. In addition to aggregate for the concrete tank work the construction of the trickling filter alone required 225,000 cu.yd. of crushed stone, ranging in size from 1½ in. to 3 in., and the manufacture of 2,000,000 cement mortar beams, 16 in. long, 4 in. wide and 1½ in. thick. These items presented the greatest problems and it was considered advisable to open a quarry, erect a crushing plant and

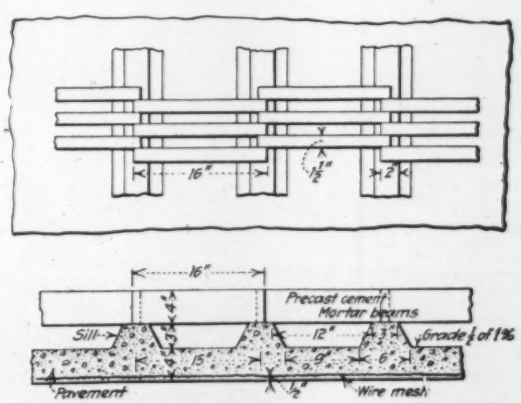



FIG. 3—DETAIL OF TRICKLING FILTER FLOOR

also a plant for the manufacture of precast cement mortar beams, and to open a sand pit. All this required much equipment.

The crushing plant consists of one 30x42-in. jaw crusher, used as a primary breaker, and two 13-in. jaw crushers used as secondaries, together with necessary elevators, scalping and sizing screens and bins. The stone less than 1¼ in. is used as coarse aggregate.

A cement storehouse, capable of housing 25 cars of cement, was erected near the terminus of the standard-gage siding and near the crusher. All cement is unloaded from the cars by means of pallets and gravity conveyors. Boxes, containing two bags of cement, are filled by the storehouse men and lined up on gravity conveyors set in a horizontal position in readiness for the charging of batch cars. This method allows the batch trains to proceed without undue delay. An electrically-driven cement-bag cleaner was installed which reclaims 1 bag of cement from every 60 bags cleaned. All other materials such as lumber, steel and coal are transferred to the narrow-gage cars and transported directly to the work.

A two-stage compressor having a displacement of 599 cu.ft. per minute furnishes air for quarry drilling and for drill sharpening at a blacksmith shop equipped with a sharpener and an oil furnace. Ingersoll-Rand Jackhammers Type DDR are used for down holes, the Type DCR for block holing and the X-70 Leyner-Ingersoll Drifter for snake holes. The rock is loaded by two steam shovels into 4-cu.yd. dump cars from which it is dumped into the primary crusher.

A used brick press was purchased and remodeled to produce the cement beams required for the trickling filter floor. This machine turns out a very satisfactory product at the rate of 8 per minute. The press is fed by a continuous mortar mixer, the mixture used being 1:3. Very little water is used before the beam is pressed. The beams are caught on wooden pallets as they come from the machine and are sent to the curing chambers on gravity conveyors. Men stationed in the curing chambers remove the loaded pallets from the conveyor and stack them seven high. The product is very dense due to the great pressure exerted by the machine. The beams are cured for 48 hours under a temperature of 125 deg. F., and are frequently moistened by nozzles producing a very fine mist. An attempt was made to cast the beams by hand but the product proved much inferior and more expensive.

Practically all material is moved on 3-ft. gage track.

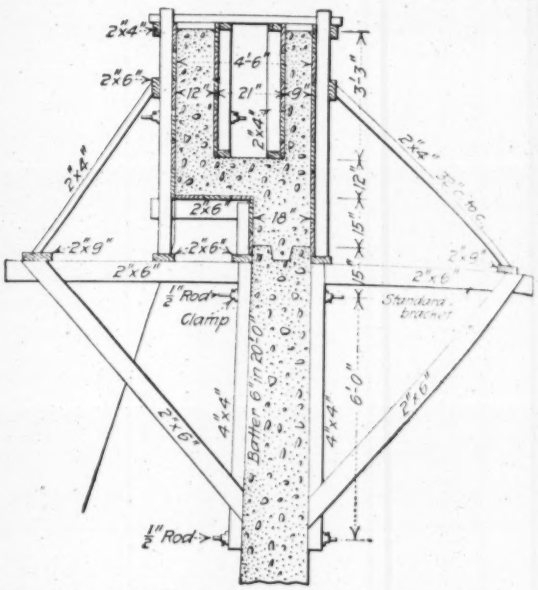



FIG. 5—BRACKETT SUPPORTS OUTSIDE CHANNEL FORMS

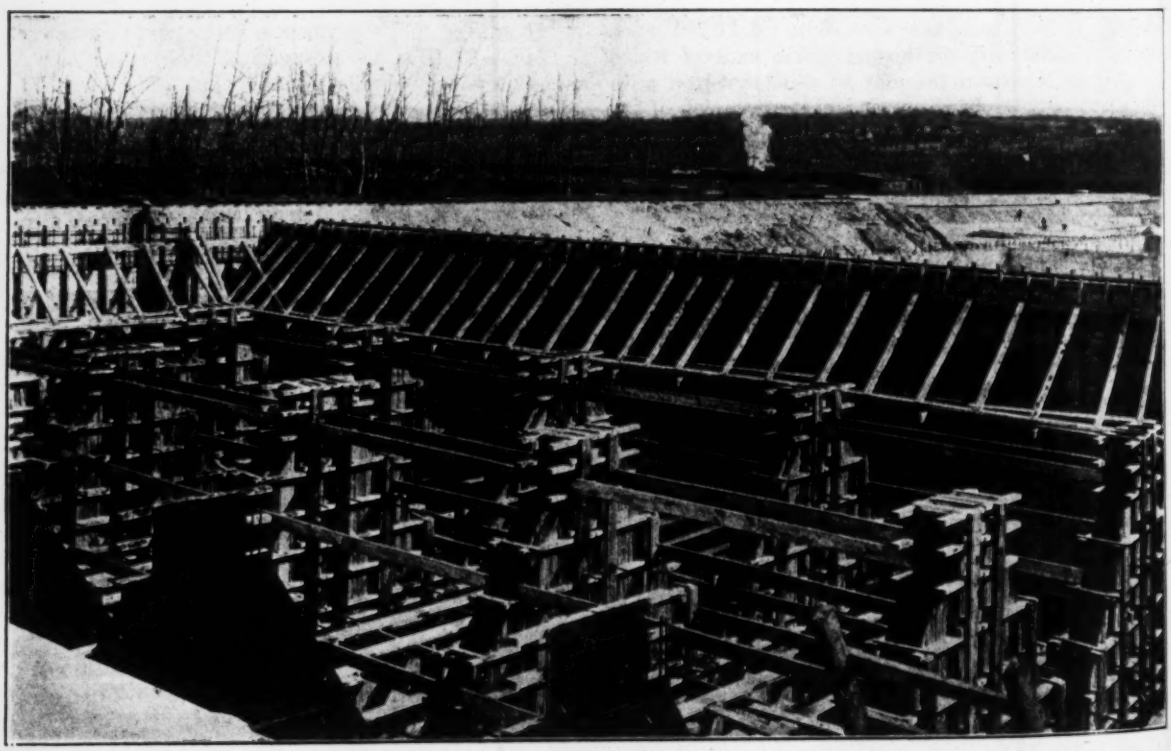


FIG. 4—TYPICAL FORMWORK WITH BRACKET SUPPORTS

Over three miles of track are used in the entire plant layout. Four 9-ton steam locomotives and seven 6-ton gasoline locomotives are in operation the greater part of the time. The maximum grade on track, which is in constant use, is 4 per cent. Three lines of track parallel the Imhoff tanks and come beneath the cableway span. One track on the south side of the tanks is used to transport material to the work at a high

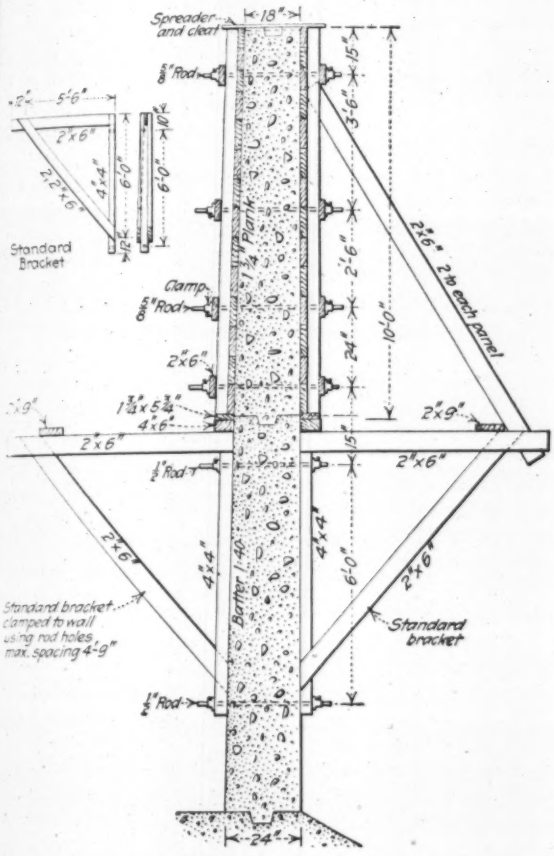



FIG. 6—BRACKETS FOR TOP LIFT OF WALL FORMS

level, while the track immediately north of the tanks serves a similar purpose at a low level. The latter track also handles the mixed concrete from the 28-S mixer. The third track is at the high level and is used by batch trains serving the mixer.

A carpenter shop with all necessary machinery was erected to the west of the Imhoff tanks at a point where there was ample space for piling lumber. Used lumber is returned to a saw installed near the tanks and is used where short lengths are required.

The principal piece of hoisting equipment on this work is a cableway, with movable towers, having a span of 374 ft. and a lifting capacity of 4 tons. This type of hoisting equipment was selected for the construction of the Imhoff tanks and has proved to be well adapted for this type of construction. It is easily and quickly moved by its own power. When removing forms and falsework which were to be moved ahead on the work they were piled on the front of the platform of the towers and moved ahead with them. It was an easy matter to keep the concrete fairly level in the forms. Much of the concrete was of such a stiff consistency that a chuting plant would have been useless.

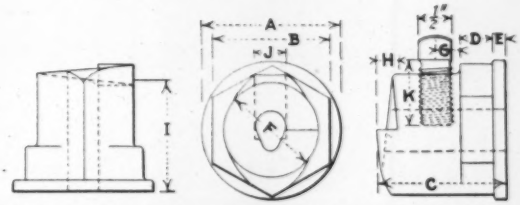



FIG. 7—CLAMP FOR TIE RODS FOR WALL FORMS

A 28-S mixer was used while concreting the heavy section work, the set-up of this mixer being so arranged that batch cars could be dumped into the batch hopper. Trains of six batch cars receive measured quantities of stone and cement at the crushing plant and cement storehouse and later take on measured quantities of sand from bins located near the mixer. Three trains are constantly serving this mixer. Sand of excellent quality is obtained on the property, the charts being loaded by Fresno scrapers through a trap in an overhead platform.

By a short extension of the New England Power Company's high-tension line and the installation of transformers, electric power was available and has been used for the crushing plant, compressor, cement beam plant, cableway, concrete mixer, carpenter shop and pumps. Seventeen motors with a total of 550 hp. are in use. This power is extremely satisfactory and reliable. Only one serious interruption of service has been experienced, this being due to an ice storm of unusual severity. The loss of the power was of no importance as it was impossible to proceed with the work for several days.

*Construction*—The difference required in elevation between the surface of the sewage in the Imhoff tanks and the surface of the final effluent is 25 ft. In order to obtain sufficient fall through the plant it was necessary to lower the level of the Blackstone River at Hull Brook. The river level was lowered 3 ft. by excavating a new channel as shown by Fig. 1. This excavation was made by two steam shovels, one passing the material to another located on the bank. In addition to the excavation of the new channel about 500 cu.yd. of ledge were removed which almost completely blocked the course of the river. During this work the river water was diverted to an old barge canal which formerly connected this city with tide water. The excavation for the effluent channel was then made, thereby lowering the water table at the site of the trickling filter about 4 ft.

Practically the entire site of the Imhoff tanks, dosing tanks, trickling filter and secondary tanks was a thickly wooded swamp having a gravel bottom overlaid with peat varying in depth from 2 ft. to 12 ft. Two steam shovels loading narrow-gage trains were used to re-

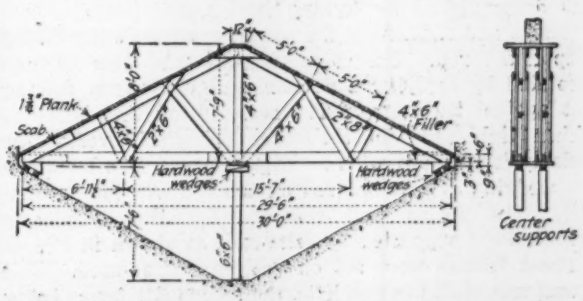



FIG. 8—FALSEWORK FOR TRANSVERSE WALL FORMS

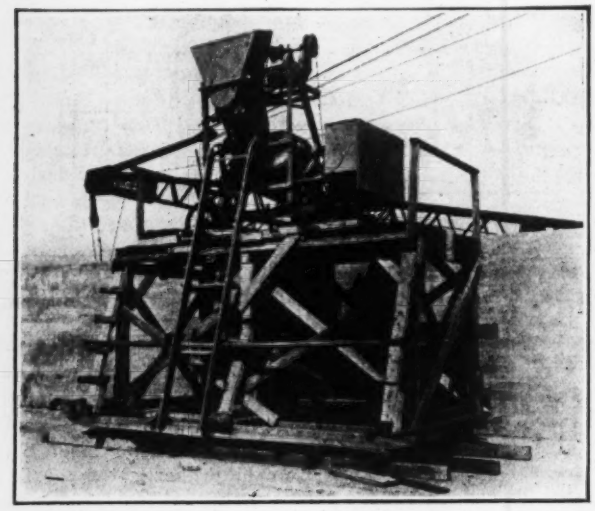


FIG. 9—OUTFIT FOR CONCRETING FILTER WALLS

move the peat. Good foundation material was several feet below the subgrade of the filter area. This was brought up to grade by backfilling with gravel which was allowed to settle and later rolled. The bottoms of the Imhoff tanks are about 7 ft. below ground-water level. A 5-in. electrically driven centrifugal pump has easily and economically taken care of the water. As soon as the excavations for the hopper bottoms were completed the subgrade was roughly plastered with 2 in. of concrete in order to preserve the shape of the excavation. The hopper bottoms were constructed by using stiff concrete well tamped and finished with 1 in. of cement mortar. At first forms were used but they proved expensive and difficult to place and the results were not always satisfactory.

Panel forms 7½x10 ft. in size, Fig. 4, were used extensively on the tank wall construction. These were of fairly heavy construction, 1¾-in. planks being used instead of boards. Some of these panels have been set twenty times and are still in good condition. The walls of the tank were constructed in three lifts, the forms being supported and sway-braced by brackets attached to the preceding lift as shown in Figs. 5 and 6. Rods and clamps of ⅝-in. steel were used to tie the forms for concreting. These rods were pulled, the forms removed and brackets fastened to the wall by ½-in. rods and clamps. A new rod clamp, on which a patent has been granted, was developed on this work and has proved very satisfactory, Fig. 7. This clamp has a cam-shaped face by means of which it may be tightened against the form by temporarily using another clamp which is a duplicate of the first. This is accomplished by locking the cams on two of the clamps and tightening the setscrew on the outer clamp upon the rod. The clamp nearest the form is then rotated by applying a wrench on the hexagon forcing it against the forms. The setscrew on this clamp is then tightened and the outer clamp removed. The clamp is provided with an ellipse-shaped hole by which a wedging grip is secured on the rod without bending it. The forms and concrete for the transverse walls were supported by falsework as shown in Fig. 8. These frames were set on wedges and re-used. This wall was placed in two lifts, the second lift forms being supported by a staging clamped to the first lift of the wall. The panel forms for the vertical gas vent walls were supported by pieces clamped to the second lift of the transverse walls. This method of supporting forms saved considerable falsework which would have been difficult to erect owing to the sloping hopper bottoms and the fact that they were nearly always flooded.

A 1:2:4 concrete mixture has been used on nearly all the work. The concrete was mixed at a central mixing plant, discharged into controllable form buckets and run on a narrow-gage track to the cableway by which it was placed in the forms. While the cableway was handling a bucket of concrete the locomotive returned to the mixer with the empty bucket for another batch. This system worked out well as both operations required about the same time. Walls running at right angles to the cableway were concreted by moving the towers, the concrete being placed in several walls during one operation. In the case of thin walls the concrete was shoveled into the forms by hand, no attempt being made to place it directly into the forms by the bucket.

Concrete work on heavy wall sections was continued during the winter, the panel forms being boarded on the outside of the studding and the space packed with straw. The top of the wall was protected by tarpaulins under which live steam was exhausted for 48 hours. Concrete was not placed in forms on days when the temperature was below 15 deg. F. at 8 a.m. It was estimated that this cold weather work cost from 25 per cent to 30 per cent additional and was carried on in order to advance the construction as fast as possible and to retain a large part of the working force. No attempt was made to concrete walls of light section during cold weather.

The sedimentation slopes are constructed by means of the cement gun, the gunite being shot against a form. The slopes are 3 in. thick and well reinforced with triangular mesh and diagonal rods. The mixture used is 1:3, but owing to the rebound, which is largely sand, the material as actually placed is estimated to be approximately 1:2½. The sand and cement is passed through a ⅜-in. screen before being placed in the gun. A rough coat 2½ in. thick is shot first, followed by ½ in. of finish. The finish coat is troweled with plastering trowels. This work is done under canvas in order to protect it from too rapid drying and sudden showers

FIG. 10—CONCRETING SILLS, TRICKLING FILTER FLOOR

which might damage fresh work. The covers are left on for 5 days, during which time the slopes are frequently wet down. Experience indicates that this is essential to good work. The forms for this work were set on wedges in order to guard against possible damage to the work during the removal of the forms. In order to concrete about 3,000 ft. of wall which will enclose the trickling filter a mixer was placed upon a raised platform and provided with an extended skip track, Fig. 9. Platform and mixer are removed on rolls.

The 4-in. concrete floor and the sills of the trickling filter floor are concreted by means of buggies and one-bag mixers. A steel form for the sills, Fig. 10, which keeps its shape and is easily filled was designed on this work. Before dumping the crushed stone of the filter upon the beams it is necessary to carefully place about 6 in. of stone in order that the drains will not become clogged due to stone falling between the beams. When this work was done by hand-placing it was found that there was a tendency of the workmen to fit the stone together thereby destroying the air space of the floorings. In order that these stones might be dumped upon the beams from wheel-barrows and the drains be kept clear, sheet-iron pans 8 ft. long were placed in the drains to catch falling stones. These pans are moved ahead and cleared of stones as the work progresses. It is essential that the stone of the filter be kept as free as possible from dust and fine stone. Screens of 1¼-in. mesh were placed on blocking 6 in. above the floor of the dump cars which transport the stone from the crusher bins to the bed. In this way a false bottom is formed which retains the dust and fine stone. After the stone has been dumped the cars are run off the filter and dumped to the other side which removes the dust and fine stone.

## Will Not Abandon Severn Tunnel

The published statement that the Great Western Ry. of the United Kingdom is planning to abandon the tunnel under the Severn River is denied by an official of that railway. This engineering marvel of 1886, in the course of industrial progress has become a limiting factor in the most expeditious handling of the increasing traffic movement between England and South Wales. The plan to bridge the Severn from Beachley to Aust is simply to provide an auxiliary route. It is the intention to continue to utilize the tunnel to the maximum of its capacity for an indefinite period to come. With the coming of electrification at no distant day, the one objection to the use of a tunnel nearly five miles long will be overcome in the elimination of smoke. The cost of maintaining the tunnel has been remarkably low and it requires very little attention per day despite the fact that it has been in use more than 37 years. The detailed arrangement for the bridge probably will be announced in the near future. The structure will carry four lines of track and a broad roadway for vehicular traffic. It is expected that the government will be a heavy contributor to the cost of the bridge as there is almost as great need for additional highway facilities between England and South Wales as there is for an auxiliary railroad route. The railroad company is insisting on the construction of a bridge with sufficient clearance to make a draw-span unnecessary. This probably will mean that a clearance of 60 ft. at high tide will have to be provided. The cost of the structure is expected to be $25,000,000.

## Height Limits for Chicago Buildings

AN INCREASE in the height limit of buildings in the "loop" or business district of Chicago is made practicable by a decision of the corporation counsel to the effect that the new zoning law is superior to the city's old building code. That code limited the total height to 400 ft., including a tower, and also limited the height of main structure to 260 ft. At present the only building which exceeds that limit is the Chicago Temple Building, which houses a Methodist church and is surmounted by a steeple tower or spire extending to a height of 556 ft. This construction was made possible by a special city ordinance, based on the ecclesiastical purpose and design, while the spire gives little obstruction to light or air. In designing the new Straus Building a 10-story rectangular tower was provided, rising above the 22-story main building and having its roof 475 ft. above the street level. Objection to this was made on the part of the city, but the objection is disposed of by the legal opinion noted above.

Under the zoning ordinance (reviewed in *Engineering News-Record*, May 31, 1923, p. 958) the height of main building in the loop district is fixed at 264 ft. No maximum height for a tower is specified, but there are certain restrictions. Under this ordinance the tower of a building having the dimensions of the Straus Building might extend to a total height of 565 ft. The limitations of tower design under the building code and the zoning ordinance are as follows:

*Floor Area*—Building Code: In no case shall the area of the tower exceed 3,600 square feet.

Zoning Ordinance: The area of the tower at its base shall not exceed 25 per cent of the area of the lot on which the building is erected.

*Width*—Building Code: The tower shall not exceed in width one-fourth of the street frontage of the building on which it is erected.

Zoning Ordinance: The face of the tower shall not exceed 50 per cent of the street frontage of the building.

*Volume*—Building Code: The area of the tower shall in no case exceed 15 per cent of the area of the building upon which it is erected.

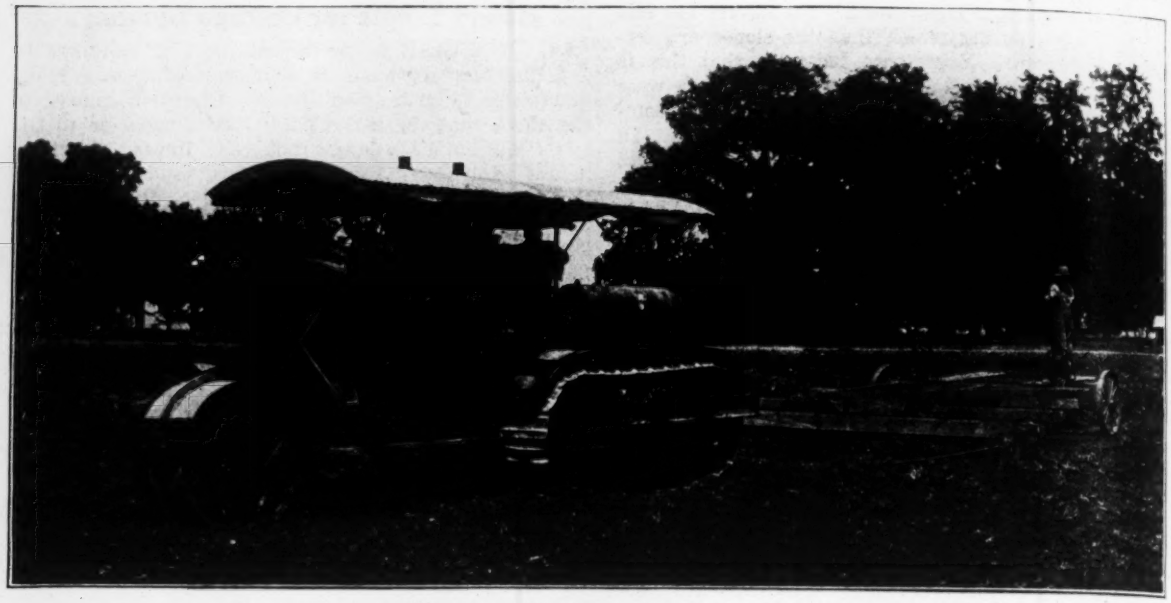
Zoning Ordinance: The volume of the tower is limited to one-sixth of the total volume of the building measured in cubic feet.

*Height*—Building Code: In no case shall the height of the tower exceed 400 ft. above the street level.

Zoning Ordinance: This ordinance makes no mention of any limitation of height. The height of a tower is governed by the provisions indicated above.

*Cornices and Parapets*—The old building code permitted a cornice projection of 5 ft. The new zoning ordinance provides that at the top of a building the cornice may not project more than 2 ft., but it allows the cornice to be increased beyond the 2 ft. to a maximum of 5 ft. on a sliding scale, depending upon the distance below the height limit that the cornice is placed on the building. This ordinance also places a limit of 8 ft. on the height of parapets. There was no such limit clearly stated in the building code, with the result that there are said to be parapets 30 ft. in height in Chicago.

*Alley Set-Back*—Another regulation provided by the zoning ordinance is the set-back along the alley frontage of buildings. In the downtown district no wall of a building may be erected nearer to the center line of an alley than a line beginning at a point in the middle of an alley and leaning toward the building line 1 ft. for each 10 ft. in height.



Tractor and Checker at Work on Durham State Land Settlement

# *Federal Land Reclamation: A National Problem*

## 5. After Reclamation, Organized Land Settlement

By GEORGE C. KREUTZER

*Superintendent, Durham State Land Settlement, and Executive Officer the State Land Settlement Board Durham, Calif.*

*The fifth of a Series of Articles on the History and Performance of the Great Government Adventure in Irrigation of the Arid Land of the West.*

*What Mr. Kreutzer sets forth in this article is based on more experience than that derived from the two California settlements. In 1909, after a period with the Reclamation Service, the author went to Australia with Elwood Mead and worked with him in land development for the state of Victoria. They established 32 settlements there. Careful observation of the conditions and problems of this work forms part of the background of the present article. Readers interested in the early history of the Durham settlement will find a useful account in* ENGINEERING NEWS-RECORD *of Dec. 5, 1918, p. 1014, under the title "Developing Irrigated Land with Selected Settlers."*—EDITOR.

IF AN IRRIGATION project is to succeed, the payment for land irrigation works must come from the sale of the products raised on the farm. This means that the settler must make a success of his farming, and his success in turn is dependent on getting his farm into full production at the earliest possible time. The common belief that good soil and an adequate water supply are all that a settler needs to start farming is a fallacy. Much more is needed; the settler's problem has just begun when the engineers have finished the canals and put water on the high corner of the farm. But reclamation has been mostly engineering. Little or no attention has been given to the aid and direction of settlers, and no financing of the settlers has ever been done in this country.

The development of raw land to the point of satisfactory production is expensive. The erection of farm cottages and barns takes time and money. Yet the family must be housed and land must be graded and farm ditches built in order that irrigated crops may be grown. If there is only one pair of hands to do all the work, something must remain undone; the farm work usually suffers and a cropping season is lost. Moreover, grading land, building ditches, and erecting farm buildings are not farm work. Many farmers have neither the skill nor the inclination to do it well or effectively.

*Some Neglected Matters*—Careful selection of settlers, intelligent guidance, assistance with money for worthy projects, and the organization of co-operative marketing are some of the things that have been neglected. Community spirit and a desire to co-operate with one another must be encouraged to accomplish for the individual the things that he can not do for himself. Collective bargaining must be a part of the plan. Co-operative purchasing and co-operative marketing must be done when and where they are economically sound. When none of these things is done for the settler he may scratch out a living but he is rarely able to pay interest on the cost of his farm or reclamation charges, much less on the capital debt.

Small farms well tilled and efficiently equipped are the kind that pay. When raw land was cheap and taxes and irrigation charges were low it was not so important that the whole farm be immediately put under intensive cultivation. Returns from crops that could be pro-

duced with little work and capital were sufficient to meet fixed charges. But under present-day conditions, in order to colonize successfully settlers must have long-term credits and enjoy low rates of interest to purchase their farms and make needed permanent improvements and to provide live-stock and equipment. There is nothing new or experimental in supplying such credit. Holland, Denmark, Great Britain, Germany, Italy, France and Australia loan money to settlers at rates of interest from 2½ to 4 per cent and for periods of from 40 to 98 years. The loans are not subsidies, simply loans; but as such they form the vital feature in a workable plan. These countries realize that their social, economic and political salvation are dependent on a home-owning population. Denmark has been converted from a country of tenants to one of home owners in less than half a century—the result of a sound land settlement policy.

*California Settlement Law*—In this country no attention was given to organized land settlement until California passed its state land settlement act in 1917. It provided long terms on the purchase price of the land; loans for effecting improvements and for the purchase of live-stock and equipment; and service in farm engineering, animal husbandry, orcharding and other branches of agriculture. Aid and direction were to be fully utilized.

Two settlements have been established: one at Durham, comprising 6,400 acres, upon which 143 families are located; and the other at Delhi, of 9,000 acres, upon which 270 families are located and which finally will accommodate 360 families. The Durham settlement was established in 1918 and the one at Delhi two years later.

*Developing Durham*—The land for the Durham project was a portion of a large cattle ranch, with a skeleton irrigation system. Accurate soil and topographic surveys were made, followed by the subdivision survey. The farms were not the customary rectangular 20, 40 or 80-acre units but were of such size and shape as the character of the soil and topography indicated would be best adapted for farming and the kind of settlers who were likely to settle upon them. Proposed irrigation ditches and drainage courses were made boundaries of farm units. This minimized the construction of ditches and structures. The ease with which a rectangular farm may be worked means nothing if it is traversed by a diagonal ditch. The tract was divided into 109 farm units of 96 to 300 acres each, and 34 farm laborer's allotments of 2 acres. The price of the land was fixed according to soil type and topography, based on the productivity of the soil and the cost of bringing raw land to full production; it ranged from $48 to $245 per acre, which included a paid-up water right and full construction costs. As the survey stakes were put in for farm ditches the agricultural program proceeded rapidly. Farm laterals were built, land was graded and alfalfa sown. Areas that could not be made ready for alfalfa were sown to grain.

In June, 1918, the first 60 farms were thrown open for settlement; 900 acres of alfalfa were established and over 1,200 acres of wheat and barley were ready to cut by the end of June. All farms had not been planted, but those that were proved most popular with the applicants; they realized the benefits to be gained from buying a farm where harvesting would be the first agricultural operation. The planting work was charged to each unit at cost, and grain crops that cost an average of $9.50 per acre brought returns to the settlers as high as $40 per acre one month after settlement. The returns per farm varied from $326 to $2,015, with a full summer season ahead in which to grow crops.

*What Was Asked of the Settler*—The terms of sale were 5 per cent of the selling price as a deposit and the balance payable in 40 semi-annual amortized payments which included interest at 5 per cent per annum. Thus a $5,000 farm could be purchased for $250 down and forty half-yearly payments of $190 each. A 40 per cent deposit on permanent improvements was required, the balance being repayable similarly to the balance due on land.

The Board set the minimum capital a settler should have at $1,500—more would be better, of course. Live-stock or equipment was considered as part capital. That capital was not the only asset a settler should have was fully recognized. He must possess agricultural experience, industry and good health, and generally be of such character as to make the highest use of the unusual opportunity offered. It is believed that no plan can be successful where citizenship alone is the only requirement; many failures must result from it. Agricultural experience is necessary to put energy and capital to their highest uses. Successful farming is closely coupled with hard work, careful living and a habit of husbanding resources seldom found in other occupations.

*Advising the Settler*—On each application for a farm, consideration was given to the kind of farming the applicant would follow and how he would develop the farm with his limited capital and the state's assistance; farms were granted to those most likely to utilize the opportunity offered. When possession was given conferences were held with those needing help and a program was agreed upon that would put the farm on a paying basis as early as possible.

The farmstead engineer, who was a trained architect and recognized rural building requirements, designed the settlers' houses, barns and other buildings to fit in with each settler's limited pocket-book. He got them the most for their dollars: structures of architectural merit, convenience and cheapness and at the same time adapted to additions without costly alterations. Conferences between the superintendent, the farmstead engineer, the settler and his wife often resulted in the abandonment of an expensive house plan and the substitution therefor of something cheaper but sufficient for their needs. Farmstead layouts were made showing the proper location of house, barn, garden, poultry runs, family orchard and corrals. This service prevented the settler from making costly mistakes and provided neat farm layouts. Natural advantages in topography and growing trees were made use of.

Each settler was furnished a contour plan of his farm upon which were located farm ditches, check banks and proposed structures. Since the contour interval was 6 in., most of the engineering service could be given from the plan, thus reducing field work to a minimum. This service does away with guess-work.

At least once each year the settler's assets and liabilities are summed up and his net worth determined. At the same time an operating statement is made estimating the next year's income and expenditure. This

is done primarily for the settler's information and secondly for the information of the administration—credit cannot be extended without such statement. To get data for the statement a thorough inspection of the farm must be made, and it is found that at such times the most helpful suggestions can be made for the betterment of the farmer's condition. His economic problems can only be solved when all of the facts are known.

The Settlement Act provides that up to $3,000 may be loaned to a settler upon the security of permanent improvements, live-stock or equipment. Much less is loaned to him if he can get through without the full amount. It should not be made too easy to get money, or difficulty will be experienced in getting it back. The farmer should be made to recognize his obligations and make an honest effort toward meeting his debts. This means a proper division of the farm income between the financing body and the farmers as the operators of the farms.

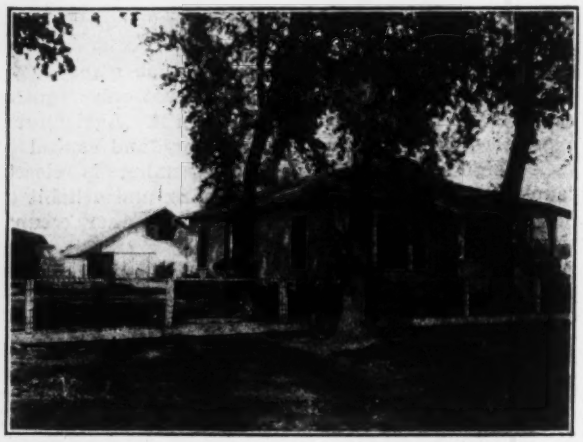


FIG. 1—A PLANNED FARMSTEAD AT DURHAM

*Borrowings*—Loans may be made on permanent improvements up to 60 per cent of their value and are repayable in 40 semi-annual payments including 5 per cent interest. Likewise, loans on live-stock and equipment are granted, when needed, up to 60 per cent of value, repayable in 36 monthly payments.

Nearly all of the settlers at Durham and Delhi have borrowed some money. Many would not have survived had provision not been made for this credit. It would have been the usual story of spending their own money and still the farm would not be on a paying basis. They would need a little more money and at best could get a short-time loan with no chance of meeting it at maturity: a few months or a year of this struggle and another abandoned farm would be left as a monument to an unsound land settlement policy.

Few people realize how costly it is to bring a farm into full production. An analysis of six of the best dairy farms at Durham shows that the cost of barns, fences, grading, alfalfa, ditches, hog houses, dairy equipment, domestic water system and other necessary improvements, not including the house, amounted to $119 per acre for a 30-acre unit. The cost of dairy cattle, hogs and other live-stock amounted to $85 per acre, and equipment and farm tools amounted to $20 per acre. This is more than $200 per acre and still the cost of the land and house must be added. The live-stock investment may seem high, but it takes good cattle to produce profit; scrubs won't do. However, the figures are not alarming when understood.

These farmers made a larger return on capital investment than do those not so well equipped. The investment was not all needed at once, and a considerable portion of it was made from income; but all six farmers had borrowed money from the state. It can therefore be readily seen that loans for improvements, live-stock and equipment speed up the development program and hasten the approach of the time when the farmer shall become self-supporting.

*How One Loan Helped*—A young couple settled at Durham and had $3,000 capital. They purchased 41 acres, of which 36 acres were in alfalfa. The cost of the grading, ditches and alfalfa was $1,640, on which they paid down $656. A comfortable cottage cost $1,500, upon which was loaned $900. The settler built his own barn at a cost of $600, and purchased a team, wagon, cow and heifer, harrow, plow, rake, mower and other tools costing $850. Initial deposit on land was $461.50. He had to have a well and hand pump and $140 worth of lumber for chicken house and other outbuildings. His expenditures to this time were more than his original capital and he would have been in debt had he not sold his first cutting of alfalfa. Soon a half yearly payment would be due the board. Before the second cutting of alfalfa was harvested an inspection of the property was made. The alfalfa was past the stage of making good cow hay. The family was called upon and the young wife said that her husband was driving a tractor in a neighboring county, while the alfalfa had been let to a neighbor on shares. The neighbor was busy cutting his own field, and counted on spare time to farm the neighbor's field, where he got only half the crop. After several questions were asked, the young wife admitted that they were "broke" and a tear coursed down her cheek as she related that they had never been entirely without funds before—Of course they hadn't! They wouldn't have had $3,000 in the bank when he was 35 and she 29 if they had not been saving and careful. A conference was arranged and the husband sent for. At the conference a program was agreed to which provided for the purchase of sufficient dairy cattle to utilize the feed. The cattle purchased could be added to their assets and give ample security. The following week they had 11 high-grade cows instead of two, and they were on the pay roll. Their first week's check from the Dairymen's Association amounted to $48.47. They had borrowed $1,110 to make the purchase of cattle, payable in 36 monthly payments of $33.30 each. One week's check would meet it and leave $15 to buy groceries. His loans at that time amounted to $2,994.

That live-stock note was paid on time and the farmer and his wife have progressed; their net worth increased from $3,000 in 1918 to $8,149 at the end of 1922. A loan at the right time rescued a somewhat hopeless situation and this family can now look forward to the future with confidence. And so nearly every settler's progress is a story.

*Land For Laborers*—There is no definite type of farm laborer in this country. Itinerant laborers drift from the grain belt to the fruit sections and finally congregate in the large centers during the winter and spend their scanty savings. Few are married, and if

they are it is a difficult struggle for parents and children. This is an unsatisfactory condition; the laborer should be a home owner and live under his own fig tree and vine. It rivets him down and gives him the same satisfaction and ideals possessed by the farm owner; he becomes interested in taxes, schools and community improvement. His children have the same self-respect and independence as the children from the farm homes, and these children are going to be the farmers of the future. Hence a place was made for the farm laborer at Durham and Delhi.

The laborer allotments are 2 acres in area and the same purchase terms are given as on the farms. Laborers were accepted as settlers on these allotments if they had the initial deposit. Except in two cases, they had an average capital of less than $200. When they could not pay the 40 per cent cash deposit on their cottage, but had skill in the use of tools, the materials were bought by the state and the labor furnished by the purchaser (generally labor on such buildings is equivalent to 40 per cent of the total cost).

At the end of 1922 these laborers had increased their assets from $6,000 to $39,000, or an average of more than $1,000 each. They are independent and owe nothing that is due; four have completely paid for land and improvements. No farm laborer has failed. The few who left did so because they were offered permanent work elsewhere that seemed attractive. One who came with $20 left three years later with $1,400 in his pocket. Another, a carpenter, who came with $150 at the age of 48 years, now has a five-room house, barn, vineyard and berry patch, cow, poultry and small tools, a Ford to take him to his work, and total assets valued at $2,700. In short, the farm laborers have worked hard because they could see daylight, because conditions had been made favorable for the economic and social growth of the laborer and his family.

*Community Matters*—At both Durham and Delhi the settlers were organized into a co-operative association to take care of their social and business needs. Through the association, purchasing was done in carload lots. Cement, posts, wire, seed, fertilizer, and many things that were needed for the development of their farms were bought and distributed at cost. No attempt was made to buy groceries or personal effects. The association acted as the clearing house for the community. Specialists from the University of California gave talks on tuberculosis in cattle and its control, management and care of poultry, pruning, deep tillage, and other timely subjects.

California is favored in having many agricultural commodity co-operative marketing associations—raisin growers, prune and apricot growers and a score more. These associations are state-wide. The Durham and Delhi settlers utilize them where their products can be marketed in that way. When products are produced in sufficient quantity and no association exists to market the product a small co-operative is organized if it is economically sound to do so

There was no co-operative association to handle the dairy products at Durham. It was discovered that a good whole milk and sweet cream market could be developed. At first a small hand separator was rented and the first week's sales amounted to only $40, but the business grew to $100,000 per year. The dairymen own a modern plant and produce milk and cream of high quality. The plant and equipment have been paid for by charging dairymen 5c. per pound of butter fat and 1½c. per gallon of milk. After the deductions were made the dairymen received more for their product than if they had sold their product independently.

*The Result as a Whole*—Thus two settlements were established where the settler worked with better tools, owned better live-stock and had mobilized for him all the skill and science of modern agriculture. Because many of the things mentioned have been lacking in land settlement heretofore, too many settlers and projects have failed.

The plan outlined and functioning in California is

FIG. 2—GETTING HIGH FARM PRODUCTIVITY THROUGH DAIRYING
Herd of Jim Braden at Delhi, Calif.

not a panacea, but it is a better way of doing it than any other way tried. People of industry, character and energy, together with reasonable capital, can and do succeed. While much is provided by the state, still the individual must do his part. He must avoid pitfalls in agriculture that ruin many.

I have no patience with men who complain that ten or a dozen dairy cows are slavery. They are not. They are an anchor to keep people from skylarking around the country when they ought to be at work. Any of us, if we expect to be of any use in our chosen line, must keep our noses to the grindstone. The study of successful people in any community proves this, hence it has been our aim at Durham to have our people engage in a kind of agriculture that is safe, in which the dairy cow plays a large part in the prosperity of individuals, insuring that the fertility of the land will be maintained, as well as bringing the farmer a ready income.

Dr. Mead, chairman of the State Land Settlement Board, said of the policy applied at Durham and Delhi: "It is a radical departure from the methods of the past. The day of the speculative land buyer is gone. The day for the creation of communities, organized for teamwork in business, in farming and in social advancement, must soon come. There has never been in the history of the world a greater opportunity to create a high rural civilization than can be achieved in the United States under a planned development by utilizing the knowledge, ability and experience of all its people."

[*The next article in the series will appear in the issue of Nov. 29.*—Editor.]

# Composite Foundations for Large Temple Building

## Concrete Piers for Column Groups—Concrete and Wood Piles Elsewhere—Underpinning for Original Footings

HEAVY FOUNDATIONS including a combination of concrete piers and concrete and wood piles, together with a concrete dome over a large basement area, are required for the Bahai temple now being built at Wilmette, Ill. An exceptional feature of the work is that after the pile footings had been built they were underpinned to give the required carrying capacity. A general description of the structure is necessary for an understanding of the foundation conditions.

The building will be a nine-sided structure about 150 ft. in outside diameter with a central space 72 ft. in diameter and 162 ft. high from the main floor to the top of a dome. This dome, with a rise of 49 ft., will be composed of steel ribs and framing and beneath it will be an ornamental ceiling dome of similar construction. Around the central space and forming the outer part of the building there will be nine rooms or compartments 40 ft. wide, one of which is assigned to stairways giving access to the galleries. At the base of the dome will be a drum or ring girder supported at nine points by groups of four columns. With the galleries and other interior structural work the foundation load at each of these points will be about 810 tons.

Nine concrete piers 6 ft. in diameter and carried down to rock at a depth of 120 ft. below the ground constitute the foundations for the central part of the building and the steel dome. At the top, each 6-ft. pier is flared out to form a rectangular cap or footing 11 x 9¾ ft., as shown in Fig. 1, to provide support for four steel columns, as noted above. It will be seen that owing to the shape of the building these columns are placed eccentrically on the footing. Steel reinforcing is used in the flaring column cap. Upon the cap is a grillage composed of nine I-beams in one direction and six in the other direction, the latter being grouped three under each pair of columns.

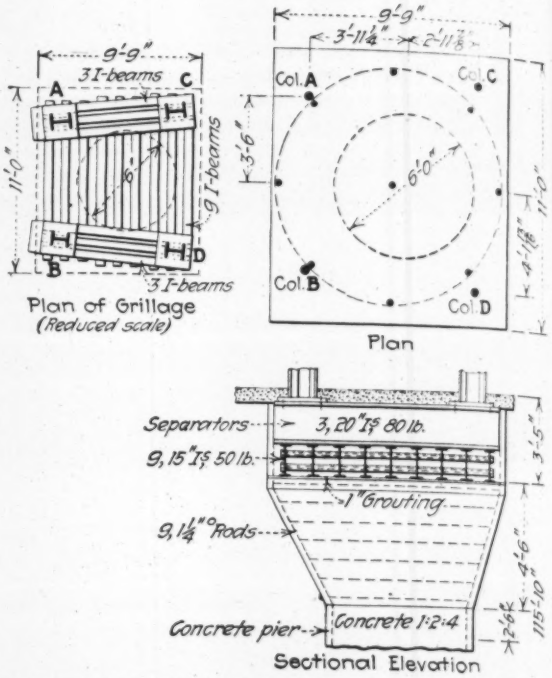



FIG. 1—FLARING HEAD OF FOUNDATION PIER CARRIES FOUR STEEL COLUMNS

Spread footings would have been permissible for the lighter loads of the outer structure around the central

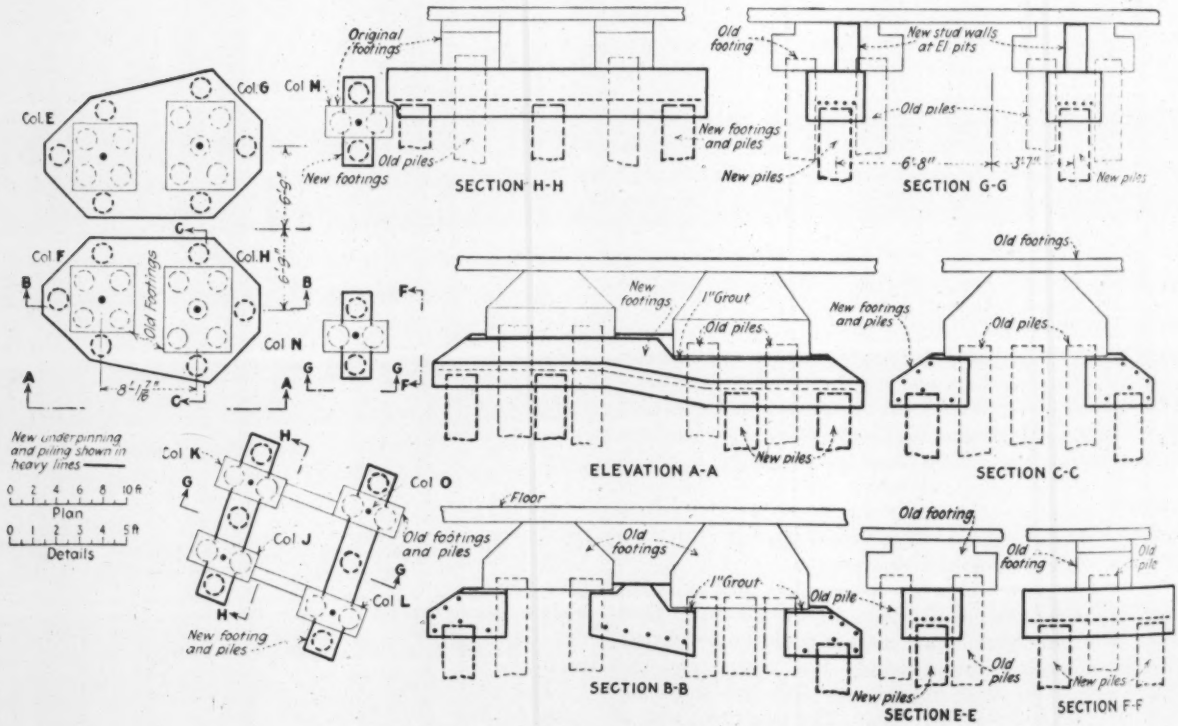



FIG. 2—COLUMN FOOTINGS REINFORCED BY UNDERPINNING

area. But to provide for greater security against settlement, in view of the fact that the central foundations are rigidly supported on rock, it was decided to use concrete piles 18 ft. long for this part of the work. It was recognized that in general it is not the best practice to combine two different types of foundation in one structure, but it is believed that in this case both types are so secure or stable that there will be no movement or settlement sufficient to cause cracks or distortion in the superstructure.

Construction difficulties were encountered with both types of foundation. Water was the great difficulty in these caps forming underpinning for the original footings, as shown in Fig. 2.

Piles of composite construction were used for this reinforcement of the outer foundations. In the first place, timber piles 35 ft. long were driven to such depth that the tops were approximately 20 ft. below the ground line. Then a concrete shaft 16 in. in diameter was poured in place on top of each wood pile and extended up to the underside of the concrete footing. These new piles were tested and showed ample supporting power.

A foundation dome for the main floor area is another distinctive feature of the work. In the basement a

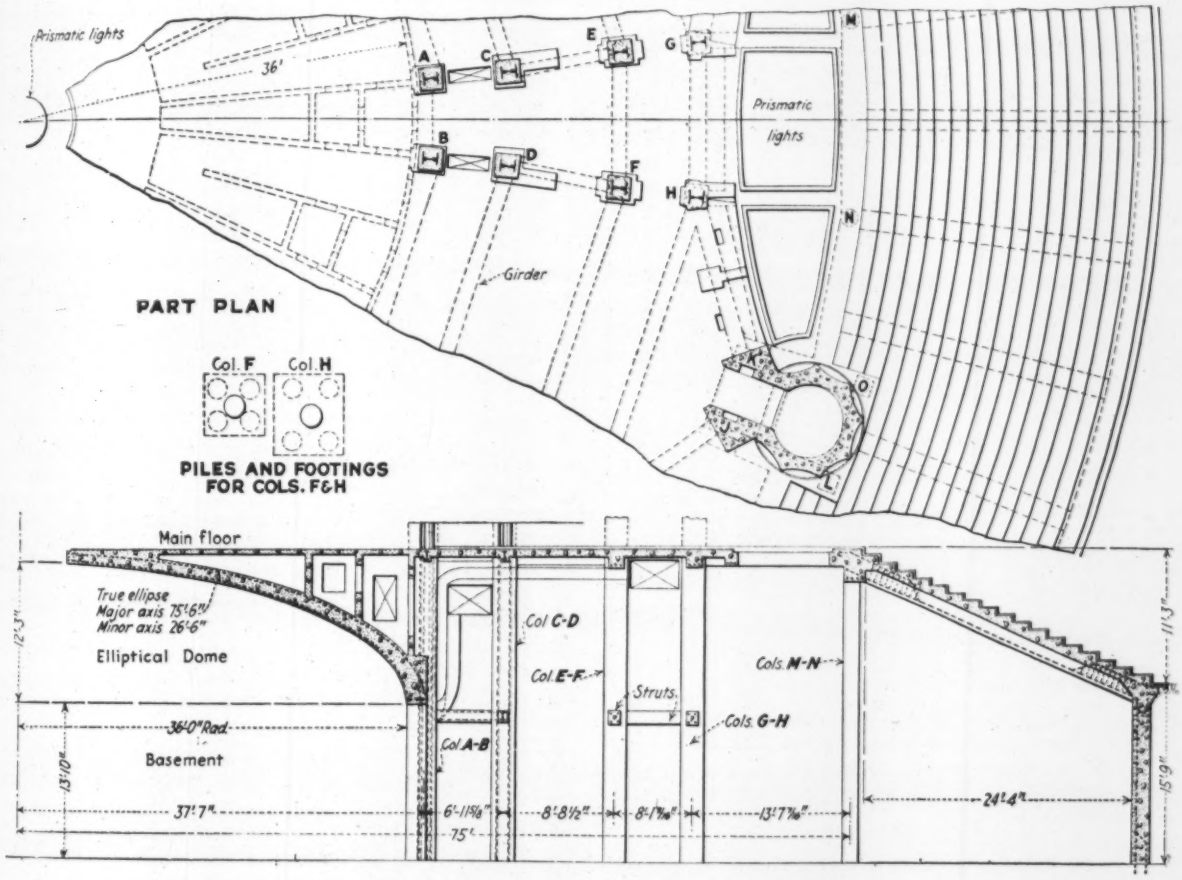



FIG. 3—FLOOR DOME AND FOUNDATION COLUMNS

the pier foundations, which were constructed in wells 6 ft. in diameter, sunk through clay and gravel. At a depth of about 80 ft. below the surface, water was encountered in considerable quantities so that the work could proceed only very slowly. At times three steam pumps were used in a single well to remove the water fast enough to permit digging. All of the wells were finally landed successfully on bed rock and then filled with concrete to elevation of base of steel columns.

Concrete cast in place and consolidated by dropping heavy weights was the method used for the concrete piling, but on testing some of the piles it was discovered that they would not carry safely the loads for which they were designed. Further examination showed that the piles had not been put in according to the prescribed method. As a result it became necessary to reinforce all of the minor footings. This was done by driving additional piles and placing concrete caps upon them,

clear space was required 72 ft. in diameter and unobstructed by columns. To meet this requirement a concrete dome is provided as shown in Fig. 3. This is formed as a true ellipse having a rise of 12 ft. 3 in. and giving a total clear height of 26 ft. from basement floor to crown. It springs from the concrete casing of the nine groups of steel columns, already mentioned. As this dome is regular in shape and is uniformly loaded, its design and construction did not involve particular difficulties. Its shell is 12 in. thick, reinforced near the inner and outer surfaces by a network of radial and circumferential rods. The floor load which the dome is designed to carry is 100 lb. per square foot.

The general plans and models for the building were prepared by Louis Bourgeois, architect, New York, with H. J. Burt, Chicago, as consulting engineer in the structural and foundation design. The foundations and basement were completed just before the winter of 1922.

# The Four Refuse Disposal Plants of Paris, France

## Contractors Collect Mixed Refuse in 700 Motor Trucks and Deliver to Sorting, Screening, Grinding and Destructor Plants Operated by Another Company—Fertilizer, Brick and Electricity Produced

By Russell L. Willard
Assistant Technical Director, "Traitement Industriel des Residus Urbains," Paris, France

IN PARIS, the different kinds of refuse from a population of about 3,000,000 are not collected separately. All ashes, garbage, and other household residue or rubbish, as well as matter from the markets and certain street litter, are taken up together. Street sweepings have most generally been flushed into the sewers. Since the war the collection has been made every day and at one time only, early in the morning. This method of a total collection daily is expensive but very satisfactory.

The collections are made in some 700 motor trucks which are owned by private companies. At present there are three companies that supply trucks with their chauffeurs for this service. The city indicates and directs the itinerary and answers for the loading of the refuse. The contracting companies are required to have a reserve supply of trucks representing one-fifth of the total; that is, the regular service is carried on with four-fifths of the trucks at the disposition of the city. The city of Paris has, in case of emergency, a reserve of 200 trucks of its own which may be put into immediate use. Every truck is motor-driven and of about five tons capacity (metric tons or tons of 1,000 kilograms used throughout this article). The remuneration of the companies is calculated from the number of trucks held daily at the disposition of the city and the distance covered by those that are used. Each of these items has a unit price but it is agreed that these prices shall be varied according to the salary that the companies are forced to pay the chauffeurs, the market price of gasoline and the amount of the current government tax on automobiles. Once the collection is made for Paris, the companies may use their trucks, under certain conditions, for other purposes or they may collect refuse in the suburbs when the city of Paris agrees to receive suburban refuse. Actually the city receives in its plants considerable quantities of refuse from the suburbs, some of which still is transported by horse-drawn vehicles.

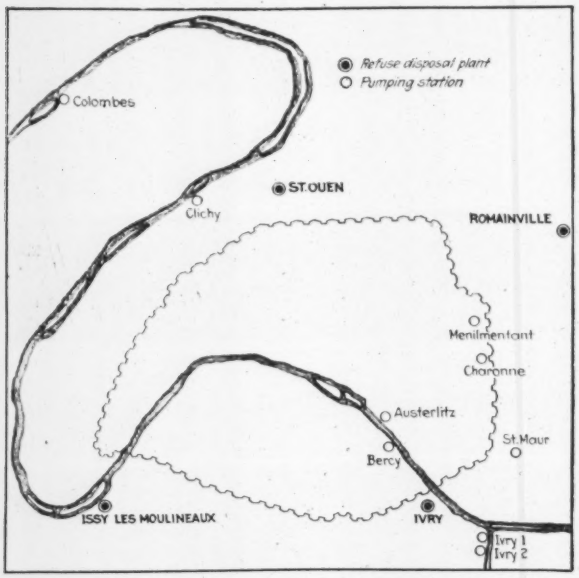



FIG. 1—LOCATION OF PARIS REFUSE DISPOSAL PLANTS
City pumping stations for water and sewage use large amounts of electric current generated from steam raised by heat from the destructors.

The refuse is hauled to four disposal stations, all of which are now operated by a single company. At these stations there is some variation in methods of treatment, but the method most generally used, which has been adopted for the enlarged stations under construction or proposed, is sorting, screening and grinding, the coarse screenings going to destructors and yielding heat that is converted into electric current and clinkers that are made into brick, while the fine screenings go to farmers for use as fertilizer. Only three of the four plants have destructors, with a combined capacity of 46 metric tons per hour. Enlargements in progress at two of the disposal stations and the provision of furnaces at the one which lacks them will bring the destructor capacity up to 122 metric tons an hour. A further increase to 160 tons an hour in the near future is probable.

It should be clearly understood that of the total amount of refuse collected actually not half goes to the furnaces, the rest is picked from the sorting conveyors and goes to agricultural land, or, in some cases when the plants are overcharged, a part is sent to special discharge areas. The comparative percentages of these divisions vary enormously with the season but in what follows it will be made clear that the city of Paris intends eventually to be equipped to burn all the refuse collected daily in the city as well as a large part of that taken up in the suburbs. Many large farms to the north of Paris receive the refuse fertilizer regularly each year but whether the farmer will pay and how much he will pay depends upon the supply in the market and it is dangerously easy to get overstocked with this kind of product.

*Historical*—Until 1899, the refuse of Paris was disposed of by teaming contractors who negotiated with the suburban farmers for the reception of their loads. A large percentage of this refuse was used as fertilizer. In 1899, a private company, the Societé des Engrais Complets, established a plant at St. Ouen (see map, Fig. 1) for the treatment of refuse. The process consisted in sorting out tin cans, bottles, old iron, etc., and in grinding what remained. This considerably reduced both the volume of refuse and the railroad freight charges. In its new form the refuse had a much less repulsive aspect, was sought after by farmers and brought prosperity to the disposal company. In 1904 and 1905, the Societé des Engrais Complets opened two other plants, one at Issy les Moulineaux, the other at Romainville. The success of the pioneer company did not go unnoticed and in 1905 another company built a plant at Vitry.

*Incineration*—Just before 1906 some changes took place that affected directly the trade in refuse fertilizer. The price of sugar fell and in addition certain legislation discouraged the general cultivation of sugar beets, the cultivators of which were the most important buyers of ground refuse. The resulting inconveniences were immediate, and, to meet the difficulties, the S. E. C. was encouraged by the city to equip its three sorting and pulverizing plants with incinerators. Each incinerator consisted of three groups of Meldrum furnaces of 75 metric tons capacity in 24 hours, one battery at each plant being considered as a reserve. These incinerators were completed in the following order: St. Ouen, August, 1907; Romainville, December of the same year; Issy, February, 1908.

*Poudro*—At Vitry no incinerator was installed. The original company began operation at a bad time and the plant went under the control of another group in 1907. This new company, La Societé des Engrais Organiques, supplemented the sorting and grinding process by screening the ground refuse. It was possible to find people who would take without charge the part retained on the screens, if it was given to them, and the fine matter was sold at a rather good price, under the name of "poudro." The first production of poudro is mentioned because screening has since been considered more important than grinding in the preparation of marketable fertilizer. The sale of poudro compelled the S. E. C. also to install screens in 1909. Fig. 2 shows a typical cylindrical screen and Fig. 3 shows the screened product as compared with ordinary refuse.

The competition in the sale of refuse as fertilizer, the increasing annual tonnage to be disposed of, the growing population of the suburbs, the more numerous restrictions imposed by the suburban mayoralties against the disposal of Paris refuse within their boundaries, and the consequent rise in the cost of transportation, soon made the first incinerators insufficient.

*Existing Plants*—The execution of the city's program of 1910 may be considered substantially as having brought the equipment of Paris to where it is today, although several changes have been made since July, 1922. The refuse is delivered to four plants, well located (see map) to shorten the haul of the collected

FIG. 3—UNSCREENED AND SCREENED REFUSE OR "POUDRO," PARIS

refuse. The plant at Vitry was abandoned. The plants of St. Ouen and Issy, since 1910, have been the mainstay of the disposal system, and St. Ouen, in particular, will not suffer in comparison with any plant in Europe in regard to the quantity of refuse treated and the efficiency of the exploitation. The standard method of French treatment today is best described by outlining the procedure at St. Ouen.

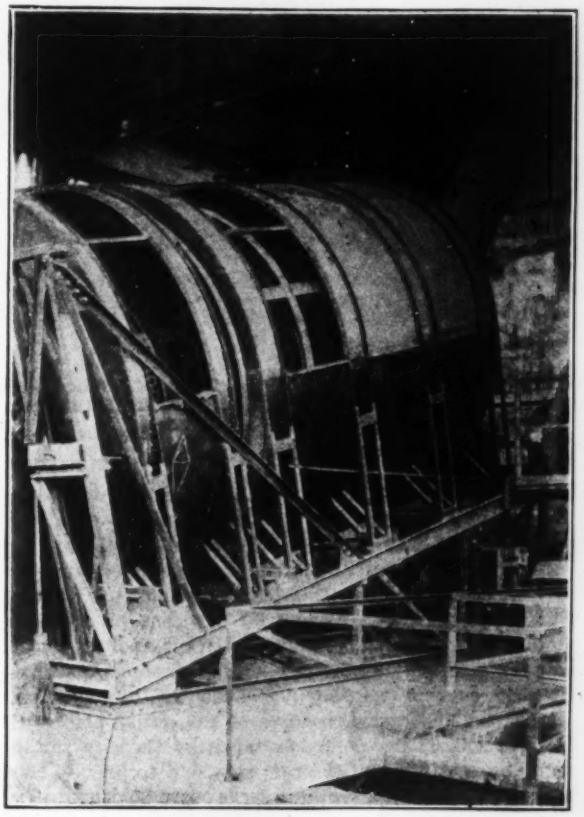


FIG. 2—REFUSE SCREEN AT IVRY PLANT, PARIS

*St. Ouen Plant*—The collecting trucks dump into a long pit, Fig. 4, the bottom of which is provided with belt conveyors. In passing along the conveyors the refuse is sorted. Among other things set apart is an enormous quantity of tin cans and boxes which are pressed, baled and sold (see Fig. 5). The conveyors discharge the refuse into elevators, which deliver the refuse to cylindrical screens. The fine screenings are sold as fertilizer and the coarse matter is passed on to the furnaces. The grinders previously mentioned are still a part of the installation, but their greatest utility now is simply to reduce the volume of the refuse when the plant is overcharged and it is found necessary to get rid of a few cart-loads by rail.

The original Meldrum furnaces have been transformed into Boussange furnaces and in addition five batteries of Heenan & Froude furnaces of six cells each have been constructed. The incineration capacity is thus about 500 tons per day. The heat combustion from the incinerators is used to produce electricity for plant purposes and for sale.

*Clinker*—The furnace clinker is drawn or pushed out in a block and moved by a traveling crane to a crusher, which in turn feeds a series of roller mills and screens. The ground clinker is fine enough to be used for brick making. Considerable quicklime is contained in these cinders, but this becomes slaked if they are left stored in piles for some months. If it is desirable, as is often the case, to use the clinker immediately, treatment is necessary. This consists of passing the clinker into huge metal cylinders, which are rotated slowly as steam is introduced. On leaving the cylinders the clinker is relieved magnetically of the large percentage of metal

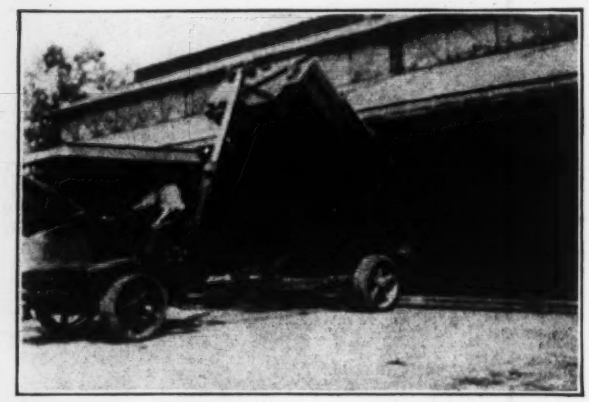


FIG. 4—ONE OF 700 REFUSE TRUCKS DUMPING IN PIT AT ROMAINVILLE DISPOSAL PLANT

fragments which it contains. After mixing with lime the material is fed to the presses by means of a helicoidal screw. The raw brick are baked by steam.

During 1922, the St. Ouen plant received approximately 235,500 metric tons of refuse, 52 per cent of which was burned. Nearly 90 per cent of what remained (or some 43 per cent of the original volume of refuse) was taken by the regular customers as fertilizer. Electric current totaling 9,500,000 kw.-hr. was produced over and above the uses of the entire plant. Of this current 68 per cent was taken by the city sewage pumping stations and the rest was sold to private companies. About nine million bricks were sold at a price slightly below that of the ordinary red clay brick. In short, since the war the St. Ouen plant has gained money for its stockholders and economized for the city of Paris.

St. Ouen (see layout plan) is the oldest of the Paris plants. It was developed little by little. There are details in the operation that do not conform to the most modern practice. These will be modified in the installations that are now under construction.

Unfortunately, all the plants have not the same record as St. Ouen. No other of them has found such a good market for refuse as fertilizer. The plant at Issy follows exactly the same process as that described for St. Ouen, but the incineration capacity is not so large. Romainville is not equipped to make brick and the incinerator is even smaller than at Issy, while at Ivry no refuse is burned. The program of 1910 provided furnaces at Romainville in addition to those in use, as well as an incinerator at Ivry, but these installations were a failure. These last were a sort of cupola furnace with revolving grate about a vertical axis. Their complete abandonment was due to the impossibility of making function the apparatus provided for the ejection of the clinker, the furnaces clogging after being a short time under fire.

*The New Program*—The contract of July, 1922, for the exploitation of the existing plants provides for their control by a single corporation, the Traitement Industriel des Residus Urbains. The company is forced to receive the entire collection of the city and there is a penalty for every ton not disposed of by the company. On the other hand, a price is paid to the company per ton received in the plants, which price varies with the market price of the kilowatt-hour sold by the large lighting and power companies. Receipts from the sale of the products of sorting, sifting or grinding, of the electric current, of brick, etc., go to the company to defray the expenses of exploitation. The city has an option on all the current produced up to and including the total needs of the pumping stations and pays the market price for such current.

The company is allowed to earn 6½ per cent on its capital account, under the conditions noted above. A deficit or profit recorded by the company at its annual closure of accounts is considered as an increase or economy made by the company in the subsidy accorded by the city per ton of refuse received by the plants and in the case where the company just makes expenses 6½ per cent is paid on the capital actions as previously mentioned. When a profit is recorded, this profit is divided between the city and the company in such a manner that as the profit increases the amount due the company is finally limited. In the event of a deficit, the 6½ per cent payable to the stockholders is diminished in proportion to the deficit until it is 4 per cent. The company is guaranteed 4 per cent on its capital, however, whatever may be the deficit.

*Enlargements*—A contract for the enlargement and modification of the equipment has been accepted by the city and part of this work is already under way. The expense of this work is covered by bond issues by the company and guaranteed by the city, the city reserving the right to buy any portion of the bonds. The city may eventually and as especially provided in the contract inherit all the installations old and new.

The incinerators of the cupola type at Ivry and at Romainville that were not a success, are being replaced by other furnaces, and the new ones are nearly completed. These furnaces will be ready to operate this winter. The resulting increase to the capacity of incinerators at Romainville will be two Bréchot furnaces of four cells each and one of two cells. At Ivry the new installations will consist of three Bréchot batteries of four cells each and six Boussange groups of two cells each. The original three Meldrum furnaces at Romainville have since the first of the year been fitted with Boussange cells and are again in service. Each of these two plants is to be provided with equipment for making brick from clinkers.

The transformation of furnaces mentioned in the foregoing is not meant to imply any adverse criticism

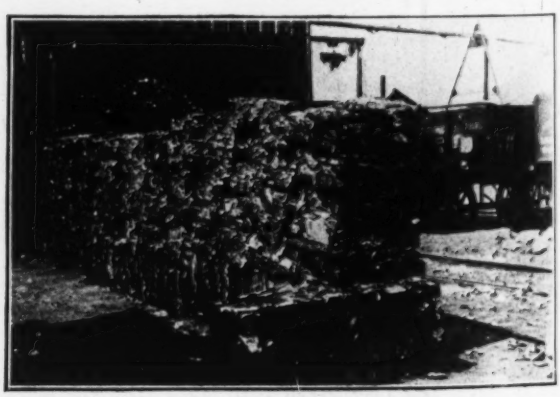


FIG. 5—BALED REFUSE, METAL AND WOOD, READY FOR SALE

of these older installations. The original Meldrum furnaces had already been in use fifteen years. During this time it was found advisable to divide these furnaces into batteries of separate cells. With this modi-

fication these furnaces were more adapted to work with a forced draft and the manipulation of the clinker became more convenient.

The Boussange and Bréchot furnaces are both of French manufacture. The existing furnaces of each type have given very satisfactory results and it is natural therefore that these furnaces should appear in the new installations rather than additional furnaces of foreign make. In both the Boussange and Bréchot furnaces the refuse is introduced by means of a cylindrical chute fixed at the top of the furnace. Each chute is provided with a mechanism to regulate the quantity of refuse falling in order not to extinguish the fire. In the Boussange incinerator the refuse falls directly onto the floor of the cell; in the Bréchot it falls first upon a preliminary drying shelf, from which it is raked into the furnace proper. Both are arranged to run with forced draft, which at the same time protects the cast-iron envelope of the cell. This envelope being hollow, the air before penetrating the small holes in the bottom is directed around it, making an air jacket. The clinker is extracted from the Boussange furnace in a block by a hydraulic or steam pusher. The Bréchot has a revolving cell which may be inverted, thus throwing the clinker out.

These furnaces burn something more than one ton per hour and they may be counted on to produce steam at the rate of from 75 to 110 per cent by weight of the weight of Paris refuse burned, depending upon the season. The calorific value of Paris refuse is distinctly inferior in the summer to the refuse collected the remainder of the year. This drop is due to the profusion of green vegetables and fresh fruits in summer and the lack of household stove and furnace ash.

At Issy les Moulineaux, a completely new plant is to be built beside the existing plant. The new plant will have ten Boussange batteries, of five cells each, constructed in pairs one on either side of a steam boiler and with one pair held in reserve. Its incineration capacity will be about 1,200 metric tons in 24 hours. The electric plant will have three steam turbines of 5,000 and one of 1,000 kw. capacity, with steam raised entirely from the refuse incinerated. The entire installation attached to the existing plant for converting clinkers into brick will be doubled.

No immediate changes are contemplated at the St. Ouen plant although the turbines may be replaced later by new and larger units.

The additions to the incineration capacity may be summarized as follows:

INCINERATION CAPACITY IN METRIC TONS PER HOUR

| Plant | January, 1922 | December, 1924 |
|---|---|---|
| St. Ouen | 20 | 20 |
| Issy | 12 | 62 |
| Romainville | 14 | 20 |
| Ivry | .. | 20 |
| Total | 46 | 122 |

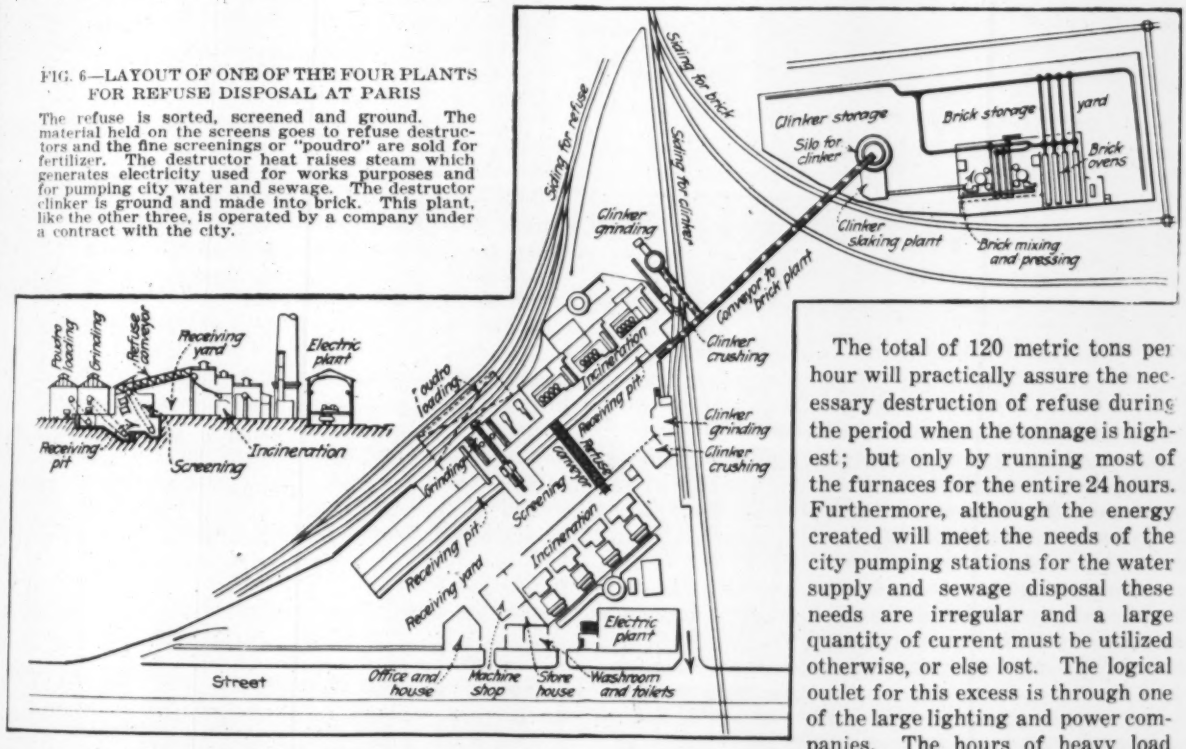



FIG. 6—LAYOUT OF ONE OF THE FOUR PLANTS FOR REFUSE DISPOSAL AT PARIS

The refuse is sorted, screened and ground. The material held on the screens goes to refuse destructors and the fine screenings or "poudro" are sold for fertilizer. The destructor heat raises steam which generates electricity used for works purposes and for pumping city water and sewage. The destructor clinker is ground and made into brick. This plant, like the other three, is operated by a company under a contract with the city.

The total of 120 metric tons per hour will practically assure the necessary destruction of refuse during the period when the tonnage is highest; but only by running most of the furnaces for the entire 24 hours. Furthermore, although the energy created will meet the needs of the city pumping stations for the water supply and sewage disposal these needs are irregular and a large quantity of current must be utilized otherwise, or else lost. The logical outlet for this excess is through one of the large lighting and power companies. The hours of heavy load made necessary by the demands of the ordinary consumer of electric current must therefore be considered. To meet this condition the destructors must be capable of burning the total daily collection of refuse in less than 24 hours. The problem is being studied at the present time and before long the total of 120 metric tons per hour designated as the capacity for the immediate future may be increased to a capacity of 160 tons per hour.

## Small Water Mains in Denver

One-sixth of the 54,911 water taps in Denver are on the 100 miles of 2-in. water lines privately owned and 19 miles municipally owned. It is not the policy of the board of water commissioners to lay 2- and 3-in. mains where it can be avoided but to pursue any other course than to lay these sizes when it means a small size or nothing is considered by the board bad business and would work a hardship on many people.

# Through the Reclamation Country

By F. E. Schmitt
Associate Editor, *Engineering News-Record*

THIS is the eighth of the series of letters written by Mr. Schmitt during a journey recently made through the West in which he visited irrigation projects, studied developments, and interviewed builders, operators and settlers, in order to present to our readers the actualities of reclamation as revealed to an unprejudiced investigator.

The series of letters began in the issue of October 4.

## Yuma, Ariz.

FROM THE situation on many of the projects it appears that if reclamation consisted only of irrigation and settling of vacant public lands it would be a simpler matter. But the fundamental formula assumed at the time the Reclamation Act was framed, namely,

*arid public lands + public water + federal irrigation works = farm land available for homesteading*

does not apply in most of the actual cases. The formula is complicated by added terms, which often tend to become predominant. In the great Southwest, a big extraneous factor consists of international water claims, since the two great streams of the region, the Colorado River and the Rio Grande (which the people south of the line call Rio Bravo), belong in part to Mexico. There are also competing state claims to water. An even bigger factor of trouble is the power question, which cannot be settled by businesslike negotiations leading up to a treaty, but calls for the formulation of broad public policies. Still another factor is flood protection, or, more broadly, river control. These four combine in the problem of the Colorado River, the biggest fighting problem of the West, and in the last analysis one of the biggest of the whole country.

*Private Land Complications*—A complication of quite different kind affects practically all the reclamation projects. This is the inclusion of privately owned land in the projects and the existence of prior water appropriations, which often took up more than the available summer flow, so that the government had to depend on storing flood waters. Nearly always, also, there existed private irrigation, covering the best part of the irrigable region and pre-empting the most favorable canal routes. These conditions, supplemented by diversity and conflict of water-right laws, gave rise in the early days of reclamation to a vast amount of trouble, unsatisfactory bargaining, and hard feelings; and some effects of these hard feelings survive. The actual record of nearly every reclamation project is therefore a tangled snarl of negotiations, agreements, purchases, and exchange of water or rights, often difficult to see through and containing occasional elements of injustice. Sometimes private interests in a strategic position drove a sharp bargain with the government, and sometimes it was the government that drove the sharp bargain. Unification of water ownership and distribution in a given region, which in general is desirable or even necessary for best utilization of the water, was not always feasible. The Service, being subordinate to state laws, had too little power to compel unification, and in consequence it was sometimes led into actions that may account for the charge that the Service was hostile to private irrigation. But, whatever griefs resulted from the unavoidable conflict of interests between the federal enterprise and private rights and from their jockeying and unfairness, they have all been chalked up against the Reclamation Service.

*Yuma and the Colorado*—For the present the other complicating factors are of more concern. There is a good case right here at Yuma. The lower valley on the Arizona side was long subject to overflow by the Colorado River, and to protect it a levee was built; but every May and June the river becomes so boisterous that a hard fight must be waged to protect this levee. The people complain much of the river-protection cost, and want the government to take care of it. Actually, the cost of the levee has already been paid by the Service, and deducted from the settlers' charge. But the annual expense of fighting the river, $90,000, represents an assessment of $1.50 on every acre of the projects, which doubles the yearly charge to the settler. Should this cost be taken over by the government? The settlers say emphatically yes.

Flood dangers and the cost of fighting them are not peculiar to Yuma, however. Districts above here are affected, and, in addition, there is the huge, unsolved problem of the lower river, where it flows through Mexico and both supplies and threatens the Imperial Valley. Also, silt is an important part of the matter. The river water is so turbid as to deposit several feet of silt each season in the Imperial canals even 50 miles or more from the intake. This means large maintenance cost; but the real menace of the silt is that it piles up as an inland delta in the lower valley and causes the river to run wild. The Imperial district has protected itself temporarily by making the so-called Pescadero cut, but this is probably only a short-time solution. Everybody hereabouts knows instinctively and positively that a single, unified treatment of the river is necessary, as furnished by the Boulder Canyon dam; and they need it urgently, and hope it will be built soon.

Whether flood protection benefits conferred by such a structure should then be assessed on Yuma and Imperial is a different question, however, not simply because of the serious burden it would place on the land, but because of the physical magnitude of the Colorado River problem as well as its interstate and international phases, which make it so decidedly a national matter that the Yuma people cannot see it any other way. The question of sharing irrigation waters with Mexico enters as an important element of the problem; the present arrangement of the Imperial Valley with the southern republic does not provide for all future needs, and as the doctrine of priority of beneficial appropriation of water which holds between the states (theoretically) has not been established as between the two countries, the relative rights are uncertain. So long as the river is uncontrolled, the rights will of necessity remain undefined and will be a constant source of worry and mutual recriminations.

*Power Ownership*—Just as the great dam scheme for the Colorado depends in part on power development and has given rise to much knife work in the West and in Washington over the ownership of this power, so also there is or has been fighting over power benefits in other places—Minidoka and Salt River, for instance—and there is an important power element in the Rio

Grande case. Unless a basic policy concerning power is soon established by Congress, such fighting may become the central feature of the whole reclamation problem. But it is important that in defining that policy, Congress should also establish quite unmistakably the ownership of present power in reclamation systems. The extreme farmers' advocates seem to think that everything should be made an appendage of irrigation: if irrigation storage also serves as power storage, they want the entire power revenue to be credited to the irrigation, as was done in Salt River, where the entire operating and maintenance cost of the irrigation system is covered by the power income. Presumably, in a case where the power revenue is large enough, it might even pay a bonus to those who reside on the irrigated lands—reside, rather than farm, because they probably would not farm under those conditions, and it might be just as well to omit building the irrigation canals. In the meantime, wherever there is power in connection with reclamation, the farmers do not concede that the government owns this power or that it may be sold to any one else, but they hold that it is their property by natural right, because the dam was built primarily for supplying their irrigation water.

*An Arizona Scheme*—State claims inject further life into the Colorado River case (and practically the same thing might be said of any other interstate stream in the arid West). This is illustrated by a very recent happening in Arizona. A filing has been made on a very large block of river water—some 20,000 sec.-ft.—by parties who are believed to be close to the state government. In support of this filing a scheme has been proposed for irrigating 2,000,000 or 3,000,000 acres (much more than is included in the famous Columbia Basin scheme) by a water system that puts all past conceptions of canals, tunnel and flume systems to shame altogether. One alleged reason for claiming so much water is that arid Arizona includes half the drainage area (*area*, be it noted) of the Colorado, hence the state is entitled to half the total flow. The argument may be absurd, but it probably could be supported just as strongly as some of the water claims that have been made by other states, for instance Colorado in defending diversions that deprive other states of water. The Arizona filing ought to make good horse trading whenever a new interstate agreement on the Colorado River problem is placed on the green table.

Offhand it is hard to see why this "navigable" river, of very great size and presenting in every one of its aspects so great a problem that it is undoubtedly national, is not *in toto* a national stream and is left subject to the capricious notions of various states. On the other hand, Los Angeles sweeps aside all notions about geographical rights by making a bid for some of the Colorado River power (after the United States Government shall have developed it by building a dam) in order to further upbuild the territory surrounding what one enthusiast called the "wonder city." And, to make the picture complete, various corporations also want the Colorado River power, for their profit.

*Internationalism on the Rio Grande*—Flood protection, power, and international and interstate water rights complicate irrigation in the Rio Grande case as seriously as in that of the Colorado, though in different proportions. There is a special complaint along that stream, however, due to a peculiar historical incident. An agreement was made twenty-five years ago between the United States and Mexico that 60,000 acre-ft. of water should be delivered each year below the international dam free of charge to Mexico. For this purpose Congress appropriated (on the account of the State Department) $1,000,000 toward the Elephant Butte dam costs; the proportionate share of the dam costs would be less than this, but the remainder would provide for operation and maintenance expense. On this latter point the farmers are not satisfied, and in the arithmetic by which they back up their case they go to the length of charging up part of the operating cost of their own distribution laterals against Mexico, which kind of figuring will probably hurt their case when the matter comes up for serious consideration. At any rate, they ask for another $1,000,000 as a gift from the national government, and, remarkably enough, A. B. Fall, when Secretary of the Interior last year, favored his own state of New Mexico by recommending such an appropriation. Congress did not pass it, being very busy.

Just at the present moment the Elephant Butte dam is in the public eye in another way, that has some relation to the back history of the matter just mentioned. A concession to build a dam on that site was granted by Congress to a private company in the nineties, with a right to all the flood waters of the Rio Grande, *gratis*, though Mexico laid claim to some of the waters of the river. Later, this concession was voided by the court for non-completion of the work, though it is alleged that acts of the U. S. Government made it impossible for the company to proceed with its work. After this happened, the people of the valley strongly importuned the Reclamation Service to build a dam there for irrigation, and still later the State Department urged the Interior Department to build a dam for carrying out the Mexican treaty provision. The Reclamation Service then, with the help of the State Department's added million, built the present dam, so that it appears everybody should be satisfied. But now comes a claim by a British subject who had had an interest in the dam concession, for loss on account of the voiding of the concession. The government's expert in its defence of this suit is Arthur P. Davis.

## Overburned Lime Causes Plaster "Popping"

Lime which has been overburned or which has been burned during hydration is the cause of popping in plaster, tests made at the Bureau of Standards have shown. In this type of failure small particles appear to expand and push themselves out of the plaster, leaving tiny holes. In extreme cases these holes may be sufficiently large or numerous to be unsightly. It has been shown that popping will not be serious if the lime is ground fine enough to pass a No. 50 sieve, as in that case the lime will be completely hydrated during the mixing and application, or else the particles of defective lime will be too small to cause noticeable holes. These tests were made in co-operation with the National Lime Association, the Contracting Plasterers Association, and the International Plasterers Union. Ninety-eight panels were erected containing different impurities in different sized particles. It was found that, with the possible exception of sand, impurities other than overburned lime did not cause popping no matter how coarse they were.

# City Problems Discussed by A. S. M. I. at Atlanta

**Many Engineering Topics Discussed by American Society for Municipal Improvements, Atlanta, Ga., Nov. 12-16, Include Responsibilty as to Health, Pavement Design, Newest Ideas in Street Lighting**

## Report of Committee on Street Lighting

By Ralph Toensfeldt
Chairman, Committee on Street Lighting; Engineer, Division of Street Lighting, St. Louis, Mo.

PROBABLY the most interesting developments to the larger municipalities who have ornamental systems under consideration is the asymetric lantern. It consists of a frame in the usual lantern form in which are mounted glass panels of a slightly diffusing character. Within this lantern and surrounding the incandescent lamp is mounted a cylindrical prismatic refractor whose prisms are so designed as to give an asymetric distribution, that is, a non-symmetrical distribution. This new development not only sends the upward light from the lamp downward so that it will be useful on the street surface but in addition reclaims, to some extent, the light which is ordinarily thrown onto the lawns and front porches *bending* it outward onto the street, thus avoiding the undesirable strong light on the front porches and increasing the illumination of the street. Experiments indicate that with this type of unit a given minimum illumination can be produced at a considerable saving in energy over systems formerly in use, and furthermore, that an unprecedented uniformity in illumination can be obtained with a minimum number of units.

Another development which will interest municipalities which hold to the center suspension type of unit in some districts, is the four-way reflector. This is essentially a suspension type of unit based upon somewhat the same principles as the asymetric above described except that it produces four beams of light at an angle of 90 deg. with each other, instead of two. It is made to be suspended over the center of intersecting streets throwing its maximum beam up and down each street. It is a highly efficient and very economical unit for such uses.

A third development which may be useful in undeveloped territories which are traversed by heavily traveled highways is the highway lighting unit. There are three types of these on the market today, essentially different in principle but all aimed to produce the same results. They are designed for a mounting height of from 25 to 35 ft., a spacing of from 300 to 400 ft. and will produce a fairly uniform illumination of low intensity almost entirely confined to the surface of the roadway. The illumination produced by this type of system will be sufficient to obviate the necessity for light glaring headlights, thus eliminating one of the most potent sources of accidents.

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## The Why and How of Street Lighting

By Stephen Carleton Rogers
Commercial Illuminating Engineer, Street Lighting Department, General Electric Co., West Lynn, Mass.

IN THE luminous or magnetite arc lamp, the light i given off by the arc flame or the vapor stream whic' conducts the current across the gap between the copper electrode, which is practically non-consuming, and the composition electrode, which is encased in a metal tube. The light is produced by electro-conduction of particles of the light giving materials given off by the negative (composition) electrode. The other type of light source is the Mazda C lamp, which produces light by high temperature incandescence.

As an illustration of what might be accomplished in the way of highway lighting from an economic point of view take for example Massachusetts (and the same might apply to any other state). There are at present roughly 1,500 miles of improved state highway, which should be scientifically lighted. This would mean an initial investment of about $5,000,000, with a yearly maintenance cost of $1,500,000 (figuring an average cost of $60 per lamp year to the city or state). A few years ago drastic headlight laws were enacted, which it has been conservatively estimated cost the automobile owners more than $2,500,000 at that time, plus the additional amount necessary for their upkeep. If this money had been expended in the proper direction, headlights would be unnecessary and safety to all would have been increased.

*Traffic Control*—On account of the vast amount of travel and vehicular traffic on our main streets and thoroughfares, some means must be employed to control or regulate it in order to further protect life, property, and the rights of each and all of us. For this reason, there have been developed a great number of various types of traffic lights or signals, etc., some of which are purchased outright by the city, some by the police department, etc. Since these devices are installed in the street, over the street, on the street or adjacent to the street, this type of unit logically should be a part of the street lighting system and controlled and owned by the central station (or by the electrical department if a municipal plant), a rate being made on the basis of a 24-hour service.

* * *

## The Cost of Adequate Street Lighting

By L. A. S. Wood
Manager Street Lighting Section, Westinghouse Electric & Manufacturing, Co., South Bend, Ind.

IT IS generally conceded that the cost per capita for an adequate street lighting system should not be less than one dollar, and yet, an investigation into this subject disclosed the fact that there were only nine states in the Union in which the per capita expenditure of municipalities for street lighting exceeded 90c., and only four where the expenditure was more than $1. At the time the investigation was made, it was found that the average expenditure for the whole of the United States was 71c. per capita. (Report of the Lighting Sales Bureau, National Electric Light Association, 1921.)

The cost of adequate street lighting systems can often be reduced if the street lighting improvement schemes are carried out under a comprehensive program co-ordinated with and included in city zoning plans. A scientifically derived, comprehensive, far-sighted street lighting program correlated with a city zoning plan is not easily worked out. It calls for specialized talent in many lines of work, and, in most cases, city officials can profit by bringing into consultation the engineers found in public utility companies, whose success depends largely upon their ability to foresee future requirements and to meet them with a minimum loss in reconstruction. This nation is becoming possessed of many vast cities and most of them—like "Topsy"—"just growed." Our large industrial establishments and other privately owned projects exemplify the economy of employing talented engineers and architects. The city is, of course, more important than any of its contributing factors; and it is unfortunate that some of our cities do not appreciate the necessity of providing sufficient appropriations for this type of personnel.

## Possible Causes of Failure of Pipe in Sand Sewage Filters

By Harrison P. Eddy
Consulting Engineer, Boston, Mass.

Worcester, Mass., has the most extensive intermittent sand filters of any city in the United States, the net area being 66 acres. For underdrains, precast cement-concrete pipe, laid 35 ft. apart, were used. The mix was relatively dry and the pipe was carefully cured. The Worcester sewage is heavy with acid pickling wastes from wire and other iron and steel plants.

Iron was precipitated in the beds, clogging them and making it necessary to dig up the underdrains. Some of the pipe went to pieces. It was found that grooves had been formed spirally around the pipe, in such fashion as to suggest that the grooves followed the layers of the wet concrete as the shell was built up by tamping.

Three explanations of the disintegration of the pipe were offered: (1) Effect of underground water in the peaty soil in which trenches for the pipe were dug, these trenches having been backfilled with sand: (2) acid in the sewage, equivalent to 1 lb. sulphuric acid per 165 gal. of sewage; (3) putrefaction of sewage in the pores of the sand beds, due to the sulphur which occurs in all sewage or due to the pickling wastes in the sewage, either of these producing sulphuric acid.

* * *

## The Engineer's Responsibility in Malaria Prevalence

By L. M. Fisher
Associate Sanitary Engineer, U. S. Public Health Service, Columbia, S. C.

Malaria, one of the most widespread diseases according to Sir Ronald Ross, causes in the aggregate more human sickness and misery than any other illness. The engineering profession must take the responsibility for causing a large part of this illness and death together with the heavy loss occasioned by the disease. Today, in the United States, engineering works are being constructed which will cause many persons to have malaria who would otherwise not have had it. Their efficiency will be greatly lowered for weeks or months and a recurring attack years hence may again result in a considerable economic loss to the persons who suffer and to the communities in which they live, and even death may ensue for some.

Dr. Carter, the foremost authority on malaria in this country has repeatedly stated that in many localities half of our malaria is man-made. Railroad builders have placed many culverts too high, and they have left many borrow pits undrained. The highway engineers engaged in building good roads are making the same mistakes. Paradoxical as it may sound, there have been drainage works which have temporarily caused an increase of malaria, either by obstructing small water courses with spoil from the large drainage ditches or from new breeding grounds for malaria mosquitoes caused in times of low water by large, wide ditches on nearly flat grades, or by both conditions. Hydroelectric developments have very frequently caused an increase in malaria prevalence because of the almost innumerable new breeding places caused by large bodies of impounded water created without regard to the conditions which permitted mosquitoes to breed profusely and entirely unhindered by the numerous aquatic enemies which are to be found in old pools or in pools properly constructed and cared for. The municipal engineer has some interest in this problem for his own water supply reservoirs may offend in the same way as a storage reservoir for a power company.

One of the sharpest outbreaks of malaria in South Carolina occurred in Greenville ten or twelve years ago, in a section of the state where little malaria prevailed at the time and where little exists now. It was attributed to the installation of storm drains and catchbasins all over the city. Prolific malaria mosquito breeding occurred in these basins and, augmented by the breeding from nearby river flats, causes a rapid spread of the disease. Instances have been reported where faulty drainage of irrigated land was responsible for an outbreak of malaria. Leaky water tanks on railroad property have caused breeding places to develop in towns and because of their location close to houses have contributed to the malaria mosquito population. Abandoned rock quarries, and even quarries in operation, containing pools of water, gravel pits along the roadside, old phosphate rock mines, abandoned rice fields, have al contributed generously to man's misery because of the malaria pestilence they have spread among persons living in the vicinity.

In some sections of the South the work of the engineer has locked up the agricultural resources of many square miles of country by making a section relatively free of malaria an intensely malarious one so that people were forced to sell or abandon their property and move away. When we stop to recall that agriculture is an industry on which many other industries are based the tremendous economic damage that is occasioned by such a procedure becomes apparent.

* * *

## Relation of Depth of Foundations of Pavements to Their Strength

By Clarence D. Pollock
Consulting Engineer, New York, N. Y.

Usually in city streets the most satisfactory foundation is one of portland cement concrete, commonly mixed in the proportion by volume of 1:3:6 and generally laid 5 or 6 in. deep upon a well compacted subgrade. Where the subsoil is sand or sufficiently porous material to provide good drainage, these depths have proven sufficient even for present day traffic. Some cities have had a tendency to lay heavier foundations, but with good subgrade material it would seem to be expensive insurance.

When the subsoil is of clay or other material which cannot be readily drained, it would seem advisable to improve the subgrade rather than to weight it with a heavier foundation. A dry clay is usually capable of sustaining a load of five tons per square foot, but when very wet the same clay may not sustain more than one ton per square foot. By excavating a few inches more and refilling with sandy or gravelly material the load will be spread so that with this and the better drainage a much greater load may be supported.

The foundation cannot act as a beam until the subsoil gives away sufficiently to allow it to act as such. The better the subsoil the greater the load required to deform the foundation. The Washington tests show that with the subgrade support the sustaining power of the concrete foundation varies more nearly as the square of the depth than directly as the depth.

Measurements show that the foundation in transmitting the load to the subgrade does not transmit it so that the pressure intensity is uniform. The pressure intensity is highest directly under the load, and spreads out over a considerable area, diminishing to nothing at some distance from the load. The intensity of pressure under the load must exceed the bearing value of the soil underneath before the foundation can act as a beam. Even a macadam, bituminous macadam or bituminous concrete foundation will not be deformed until the intensity of pressure directly under the load exceeds the bearing value of the subsoil. If the load is stationary or if the surface of the pavement is very smooth there will be simply the static pressure, but if the surface of the pavement is a little rough there will be impact and if the surface is quite rough this impact may amount to four to five times the static pressure. This is greatest when the tires are badly worn. With good well cushioned tires the impact apparently approaches more nearly the static load, and hence the advisablity of securing as uniformly smooth a surface to the pavement as possible in order that the impact of moving loads may be eliminated as completely as can be done.

In the Bureau of Public Roads tests with slabs on wet

and dry soils, the impact tests punched through the 4-in. slabs, but those 6 in. and more in depth were merely cracked while those 10 in. thick could not be broken by their apparatus even on the wet subgrades. According to this a thickness of 10 in. should be sufficiently great to carry any load that might come upon the pavement even with a wet subgrade which may be more or less plastic. However we are not so likely to have wet subgrades in city streets subject to heavy truck traffic, as the pavement is usually impervious to water and likewise the sidewalks are generally paved so that there is much less likelihood of subsoil troubles here than with suburban roads. But should there be bad subsoil conditions in general it will be found much less expensive to improve the subgrade than to pay for 4 in. of extra concrete in addition to the extra grade removal which alone would in most cases be sufficient when replaced by a more porous coarse grained material which is not affected materially by water as are the very plastic soils such as many clays. With proper support from the subsoil and a reasonably smooth surface to the pavement, a thickness of 6 in. for the concrete foundation seems adequate especially as most heavy loads are now hauled on auto-trucks having rubber tires. The trucking interests have found that it is not economical to carry loads in excess of about 750 lb. per inch width of tires. This insures wide double and triple solid rubber tires on each rear wheel and a good distribution of the load over the pavement so that by the time it is spread through the thickness of the pavement and the concrete foundation the pressure intensity is usually well within the supporting value of the soil. Some states have limited the loads permitted on their highways, but here we have a limit placed by the effect on the truck owners' pocketbook which is more easily enforced.

When in exceptional cases it may be necessary to use a greater depth of concrete than 6 in., it should be remembered that the supporting power of the concrete foundation varies about as the squares of the depths.

Another matter that the tests have brought out is the fact that while the compressive strength of 1:3:6 was 50 per cent of that of the 1:1½:3 concrete, the difference between the beam and slab strength of these two mixtures did not exceed 20 per cent.

In addition to damage from heavy loads the pavement including its foundation may be injured by water entering a clayey or other plastic subgrade material from terraces or sidewalks and lifting and cracking the foundation and pavement by the swelling of the subsoil. Sometimes this may be caused by frost heaving the foundation when there is a large amount of water in the plastic soil under the foundation. During the past season the writer was engaged upon an examination of some breaks in foundation and pavement where a study of the conditions shown by openings and the history of the breaks as to when they were noticed after the completion of the pavements and before freezing weather and the soil condition in the terraces on the uphill side and the clay of the subsoil showed conclusively that the breaks were due to the soil conditions and not to loads to which the pavement was subjected.

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## *Miscellaneous Discussions*

*Technical Papers*—Many technical papers were listed on the program. Some of these are abstracted in this issue, and of the others some are mentioned briefly below.

A plea for more palatable drinking water was made in a paper sent by John R. Baylis, principal sanitary chemist, Baltimore water-works, who stated that if the people want water of that sort it can be provided at reasonable cost. The new water supply of Memphis, Tenn., was the subject of a paper sent by J. R. McClintock, of Fuller & McClintock, and read by Mr. Cunningham, associated with that firm. An entirely new plant, except for distribution system, is being provided at a cost of $2,800,000. In will be the largest municipal plant in the country taking its supply wholly from wells. The water will be treated to remove carbon dioxide and iron.

Zoning plans for Atlanta were reviewed by Robert Whitten, city planner, Cleveland, Ohio. Atlanta was the first Southern city to adopt a zoning ordinance some two years ago. Buildings in the business district are limited to a height of 150 ft., partly because of the narrowness of the streets. G. J. Requardt, consulting engineer, Baltimore, outlined the publicity work which paved the way for the Baltimore zoning ordinance.

Sand-clay and top soil roads, with special reference to his own state, was the subject of a paper by W. R. Neal, state highway engineer of Georgia. In sand-clay roads the sand may be regarded as aggregate and the clay or silt as filler. Earlier practice was to give these roads a high crown, as much as 1 in. per foot in some cases, but this has been reduced to as low as ¼ in. The latter should be used only where the maintenance will not be good. The lime rock asphalts of the South and their use for paving were described in a paper read by E. A. Kingsley, city engineer, Dallas, Texas. In 1922, some 2,000,000 sq.yd. of this pavement were laid in Texas by the Uvalde Asphalt Co. Besides the mines near San Antonio, some are about to be opened in the Florence section of Alabama.

*Sewage and Garbage Disposal*—Two papers on night soil disposal were read. One, by Milton J. Ruark and C. E. Keefer, of Baltimore, Md., described the dumping into the sewers of night soil collected in cans from outlying districts. The other, by Mr. Decker, of the Tennessee Coal & Iron Co., Birmingham, Ala., outlined a system of collection by cans, dilution and sedimentation in tanks, and treatment on sprinkling filters, as used for more or less temporary mining camps. In discussion, H. P. Eddy, Boston, said that this is the first case to come to his attention where night soil is converted into sewage and then treated. The Imhoff tank capacity is about 10 gal. per capita, a low figure, but the night soil is free from bath and sink wastes with their loads of grease. The process is not patented.

In a paper on the Maclachlan process of treating activated sludge, J. S. McVea, city engineer, Dallas, Texas, described work now going on at Dallas to perfect the process. After the use of sulphur dioxide for conditioning the sludge before drying the sludge is being passed through a rotary screen press, and then passed between rolls. A new filter press and rolls were installed in June and quite recently the apparatus has been modified. The sludge resulting from the Maclachlan treatment, with a moisture content of about 82 per cent, goes to driers for reduction to 10 per cent. These and other papers on sewage and a series of reports on garbage disposal practice occupied a whole evening.

A paper on valuation of property for taxation purposes, by Walter W. Pollock, Manufacturers' Appraisers Co., Philadelphia, described the Somers' system of valuation of real estate. The author said that by applying scientific methods in like manner to utility rate and purchase valuations the present large differences in the figures set up by the experts of the opposed sides could be eliminated. He would use the reproduction new less depreciation method of appraisal, but based on fixed unit and other standards.

[*Further abstracts of papers presented at this meeting of the American Society for Municipal Improvements will appear in an early issue.*—EDITOR.]

# From Job and Office

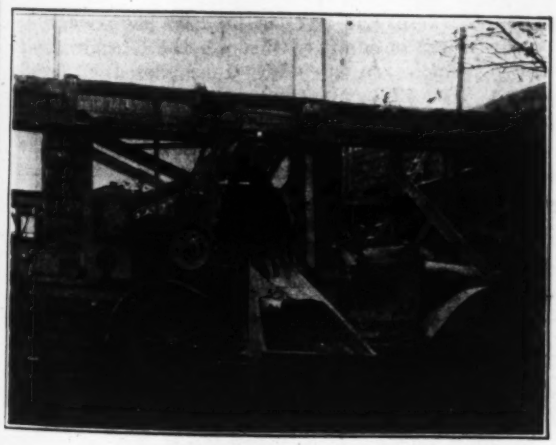
## *Hints That Cut Cost and Time For the Contractor and the Engineer*

### Mounted Concrete Mixer Saves Time and Labor for Contractor

CONTRACTORS using concrete mixers where portability is desirable may be interested in the experience of George Leavens, of Lansing, Mich., who has been able to effect savings of approximately 25 per cent in labor and even greater amounts in time by the use of a mounted mixing machine. Mr. Leavens mounted a 10-ft. mixer, which is one size larger than the average machine used by contractors on light work, on a speed-wagon chassis obtained from the local representatives of the Reo Motor Car Co.

His knowledge of gasoline engines warned him that it would be far from economical to attempt to run the mixer from the 45-hp. engine of the speed wagon when a 6-hp. gasoline engine would furnish ample power for the work. Using the speed-wagon engine for this work would also have meant wear and tear on transmission parts which might have decreased the life of the chassis by a couple of years. For these reasons a 6-hp. engine was mounted on the rear of the chassis to operate the mixer.

Mr. Leavens saves in labor through the fact the machine can be run into any desired position on the job for operation, eliminating most of the wheeling of mixed concrete. For instance, in pouring concrete for a sidewalk, he drives the speed wagon parallel to the sidewalk, pouring as he goes. The same system is employed in pouring outside foundation walls, while in pouring inside walls, the speed wagon is driven as close as possible to the point at which the work is being done.



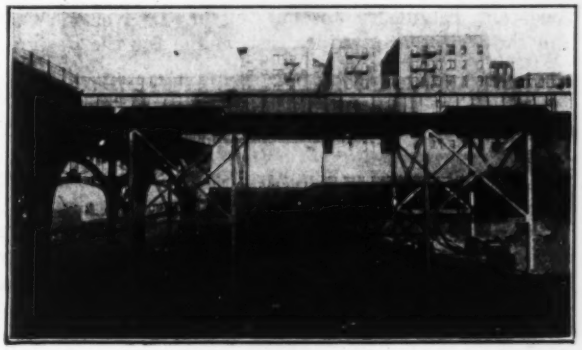
MIXER MOUNTED ON SPEED-WAGON CHASSIS

Perhaps the greatest saving in time occurs when one job is finished and the outfit must be moved to another. The jobs are seldom less than a mile apart and are often two or three times this distance from each other. With the mixer mounted on the speed wagon, however, the changes are made in negligible amounts of time.

### Unique Two-Level Street Obviates Costly Grading

By Harry W. Levy
Dept. of Public Works, Borough of Manhattan

DUE to the great difference in elevation between Broadway and 12th Ave., two parallel streets in upper Manhattan, New York, near 134th St., the latter street was left ungraded until this year. When it was decided to open the street, two possible methods of doing it presented themselves. The first was to run a uniform grade of 8.3 per cent from Broadway down to 12th Ave., a distance of about 800 ft. The other was to run a nearly level grade from Broadway out to the viaduct which carries Riverside Drive above 12th Ave. at this point. If the first method was followed it would necessitate a cut of some 10 to 45 ft. within the street line and ultimately over a considerable area outside. This would be complicated in the future by the fact that the grading of the lots on the north side would require permanent shoring for the rear walls of the buildings on 135th St.



TWO-LEVEL STREET IN NEW YORK CITY

The second alternative would require very high retaining walls at the west end of the block and consequent expensive foundation work for future buildings on the adjoining property unless these retaining walls could be extended over the building line to form the footing for such buildings along their street face. Legal restrictions, however, prevented the city from doing this and it was decided that the best plan was to build low retaining walls for the upper end of the street and then to carry the remainder on a viaduct to connect with the Riverside Drive viaduct and to grade a low-level street connected with 12th Ave. below the viaduct. This latter plan makes it possible for the owners of the lots facing the viaduct to use the lower floors of their buildings which open on the low level street for business purposes and the upper floors for high-class residential purposes.

The economic point at which the street structures should change from filled retaining walls to a viaduct was determined by the relative cost of the two classes

of work and the structures were laid on that basis. House connections for the sewer were carried through the retaining walls on two levels in the east end of the street and then the sewer was run to the lower level in a drop well built into the abutment of the viaduct.

The steel viaduct comprises two four-columned towers, made up of continuous H-columns with horizontal and diagonal bracing supporting the viaduct deck structure. Transverse girders extend over each pair of columns and cantilever some 15 ft. beyond to the building line. To these cross members are framed six lines of longitudinal girders which in turn carry the viaduct deck members. The inner and outer pairs are set higher to avoid a floor slab of varying thickness due to the roadway crown and sidewalk elevations.

At the extreme west end of the new viaduct, where a connection is made to the existing Riverside Drive viaduct, a short cantilever was inserted to avoid increasing the load on the latter structure.

The P. T. Cox Contracting Co. was awarded the contract for this viaduct at the price of $60,787.50.

Construction work was done under the supervision of the Bureau of Engineering, Department of Public Works, Manhattan, of which C. M. Pinckney is chief engineer and Ralph Lewis, construction engineer. Assistant Engineers Joseph Collyer, D. Nelson West and the writer are mainly responsible for the design.

## Tile Drains Collect Water for Small City Supply

THE CITY of Condon, Ore., with a population of about 1,300, is located on a plateau some 2,900 ft. above sea level on which there is no water suitable for a city supply. Except for a small stream called Hay Creek, 700 to 800 ft. below this plateau, the only streams within 15 or 20 miles of the city that might be used after purification lie from 1,000 to 2,000 ft. below city level. For some years a supply was pumped from Hay Creek at a point about four miles from the city; the water was taken directly from the stream without any purification treatment. This source was subject to pollution and when the time came for increasing the supply it was decided to use the natural gravel deposits of the stream as filtration beds, collecting the subsurface flow in a small reservoir built below stream-bed level from which the water was pumped to the reservoirs serving the city's gravity distribution system. The cost of this work, covered by bond issue, was $90,000.

The accompanying plan shows the general arrangement of the collection works which consist of a main line of 8- and 10-in. collecting pipe with tight joints to exclude surface water, extending up the creek bed, and several 6-in. agricultural tile lines with open joints placed 6 to 12 ft. below the stream bed and located so as to pick up as much as possible of the flow from springs which form the headwaters of the stream. Measurements in the stream bed indicated a minimum flow below the surface of about 127,000 gal. per day.

The filtering afforded by the gravel backfilling, that was carefully placed over the collecting tile, was not expected to purify the water in the sense of removing bacteria, but rather to give clear water at all times. All pumped water is chlorinated before going into the city distribution system. There are two or three ranches on the watershed above the collecting system and the chlorination is to protect from possible pollution from that source. Since the completion of the system there has been little flood water and hence the degree of clarification that will be secured is not yet known.

The reservoir is a reinforced-concrete box built across the stream bed so as to form a dam and having a watertight concrete roof so all surface water passes over it. The reservoir has a capacity of 109,000 gal., is about 10 ft. deep, and 34x46 ft. in plan. The walls are 12 in. thick and the roof 5 in. thick.

There are some small springs along the creek bed below the collecting works. Water from these flows into a gravelly backfill on the upstream side of the reservoir. When the reservoir level is pumped low enough, this spring water is admitted through the 6-in. drain-pipes shown, which are at other times closed off by flap valves. The 12-in. pipe under the reservoir was put in

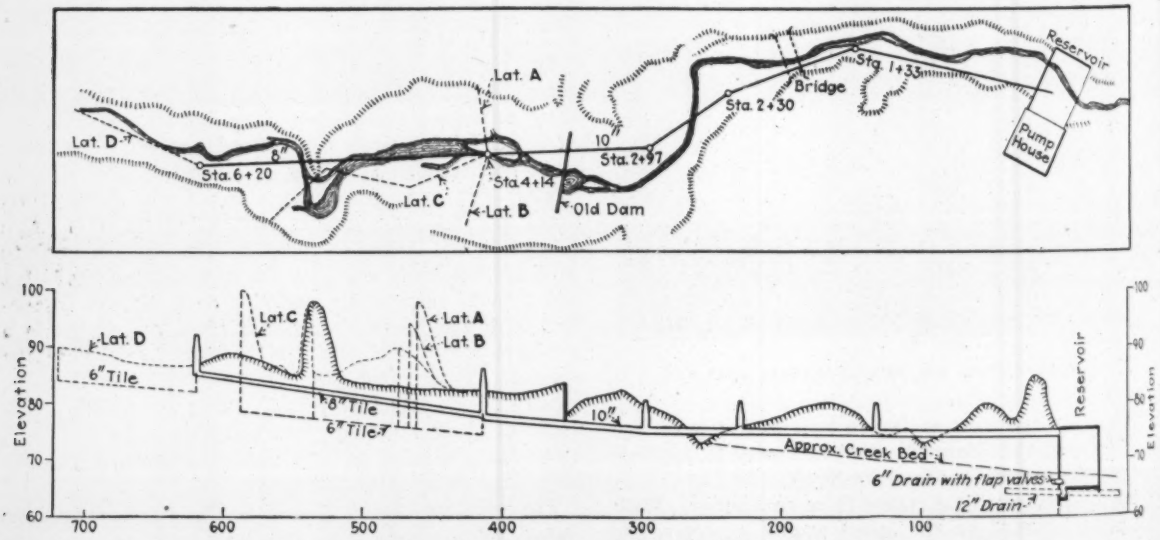



FIG. 1—PLAN AND PROFILE SHOWING ARRANGEMENT OF COLLECTION SYSTEM

# From Job and Office

## *Hints that Cut Cost and Time*

# From Job and Office

*For Contractor and Engineer*

primarily to provide a bypass for stream flow during construction and was later made to serve as a drain.

The pump house is built just out of the stream bed and above it at one end of the reservoir just described.

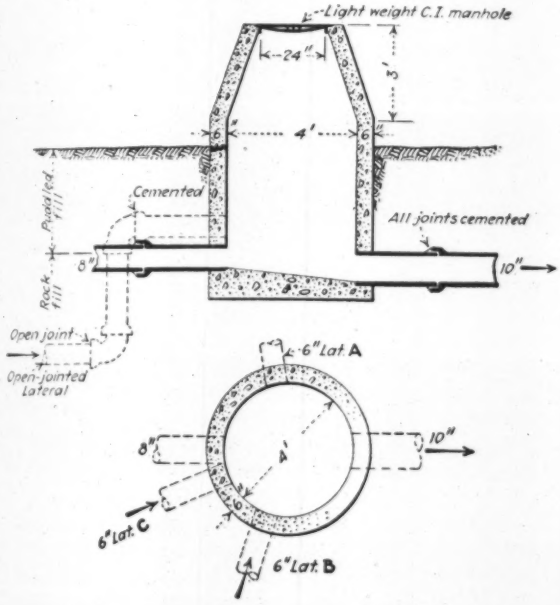



FIG. 2—TYPICAL MANHOLE DETAILS

The floor of the pump house, 17 ft. above the bottom of the reservoir, is considered to be safely above flood level.

The pumping equipment consists of two independent units. Each of these is a 50-hp. modified Diesel engine, direct-connected to a vertical, triplex, single-acting pump. These pumps deliver through 22,000 ft. of 8-in. main against a static head of 723 ft. and an estimated friction head of 57 ft., making a total of 780 ft. The engines operate on oil of 24 deg. Baumé gravity and are guaranteed to consume not more than 0.52 lb. or 0.068 gal. of fuel per horsepower per hour when operated at three-quarter load, which is approximately the operating requirement of the plant. Each pump unit has a plunger displacement of 155 g.p.m. and a nominal rated capacity of 150 g.p.m.

After operation for some time to test out the system the pumps were declared to be wholly satisfactory, operating without vibration and with a minimum of attention. Air chambers specially designed to meet the unusually high pressure requirements were installed, but some doubt is expressed as to whether these afford any advantage. Hand operated bypass lines are provided so that heavy water hammer due to starting and stopping the flow in the 4-mile line can be prevented. The pumps also have pressure relief valves set to operate at a pressure of 400 lb.

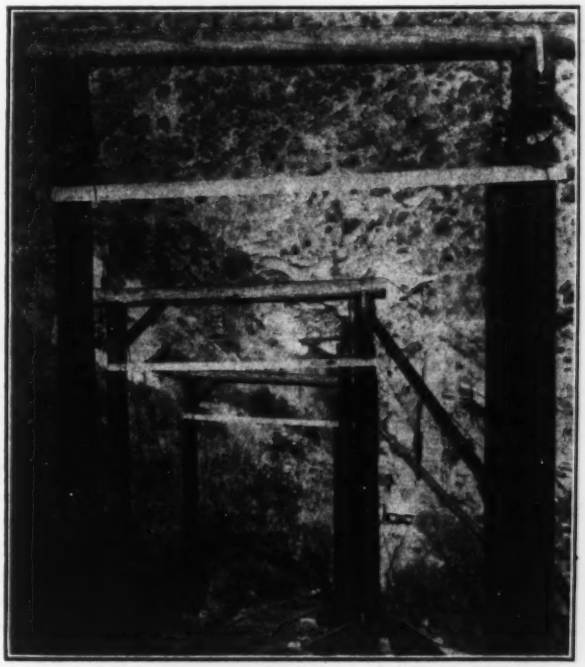
The design and construction of the system was carried out under the direction of R. E. Koon of Stevens & Koon, Portland, Ore.

## Incline Railways Facilitate Dam Construction in the West

HYDRO-ELECTRIC jobs in the far West that involve the construction of dams or power houses in deep ravines are frequently reached to best advantage by incline railways, on which flat cars, equipped with a heavily reinforced end called a "strong back," are operated with a cable and hoist. To cite three California examples: An incline on the Hetch Hetchy project has a 70 per cent grade and a drop of 1,700 ft.; another on the Big Creek project drops 2,000 ft.; while one used in building the Kerkhoff Dam was 3,000 ft. in length and had a maximum grade of 92.5 per cent.

Long steep inclines are chiefly confined to the larger jobs, such as those just cited. Sharp curvature, on the other hand, is common to inclines on jobs of all sizes, the arrangement of rollers for guiding the cable being similar to that used in logging camps. The accompanying picture illustrates the strength and simplicity of roller-guide construction commonly used on sharp curves. The use of portals instead of posts on the inside of the curve only affords opportunity for the effective use of cable sway-bracing in addition to the batter posts that take thrust directly.

The rollers are made of pipe with special fittings on each end, terminating in solid shafts of considerably smaller diameter. Rollers that carry the heaviest load are made of fairly large size, usually 6 in. in diameter. Both horizontal and vertical rollers are put in wherever the cable would otherwise come in contact with ground or structures. Special attention is paid to fitting the



GOOD PRACTICE IN ROLLER GUIDE CONSTRUCTION ON CALIFORNIA HYDRO-ELECTRIC JOB
Note grease cups at tops of rollers

bearings and keeping them well greased so friction will be reduced to a minimum. The inclines and their guide rollers are built to handle any load that a "strong back" car can safely transport.

## Electrically-Controlled Traffic Signals Adopted in Dallas

By W. J. Powell
Chief Engineer to the Supervisor of Public Utilities, Dallas, Tex.

TRAFFIC CONTROL in the business district of Dallas, Tex., is effected by means of electrically-operated signals, centrally controlled from a traffic tower at Elm and Ervay Sts. The signals flash alternately red and green lights, at intervals adjusted by the operator to suit traffic conditions, with an amber light and warning bell to mark the changes. This system has been in operation for several months with most gratifying results in the way of speeding up traffic and decreasing accidents.

Except on Pacific Ave., the traffic control signals are suspended over the street intersections at a height of 18 ft. and are served by overhead wiring. Pacific Ave. was formerly occupied by the tracks of the Texas & Pacific Ry., but since the tracks have been removed the street has been greatly improved, all the electrical conductors have been put in conduits below the street surface, the street repaved, and a new lighting system with ornamental standards along the curb has been provided. For this reason the traffic signals on Pacific Ave. are mounted on cast-iron standards, designed to harmonize with the lighting standards, and placed on concrete pedestals in the center of the street intersections. At first there was considerable opposition to placing any such obstruction in the roadway, but this opposition has not been justified by results, as the heavy concrete pedestals carrying the signals serve to separate the traffic lanes and prevent accident. At some points police and fire-alarm boxes are installed on the same standards.

TRAFFIC SIGNAL AT DALLAS, TEXAS

The system is served by underground cables connecting with the central control tower at Elm and Ervay Sts. The concrete pedestals are 30 in. in diameter and 30 in. high above the street grade, and 48 in. in diameter at the base, which is 3½ ft. below street grade. They are heavily reinforced and protected above ground by a ¼-in. boiler plate shell. The standards are painted a dark green and the pedestals bright orange, because of the high visibility of that color under all conditions. Four small red lights mounted on top of the pedestal further mark its location.

The Ashe Electric Co. of Fort Worth had the contract for the installation of the ornamental lighting system and for the conduits and concrete pedestals of the traffic control system. This work was done under the supervision of the writer and A. R. Henry. Traffic signal units were supplied by the Crouse-Hinds Co. of Syracuse, N. Y., and were installed under the supervision of Henry Garrett, superintendent of the police and fire signal system. The cost of the control system was about $12,000.

# From Job and Office

## *Hints that Cut Cost and Time*

## New Portable Tide Gage for Temporary Use

By G. T. Rude
Chief, Division of Tides and Currents, U. S. Coast and Geodetic Survey

THE U. S. Coast and Geodetic Survey has recently developed a small automatic tide gage for the purpose of providing a portable, easily-installed gage which can be used to advantage by hydrographic and tidal parties in the field at stations where it is necessary to obtain observations extending over only a few days or weeks for the reduction to a datum plane of soundings taken during a hydrographic survey, or for comparison of short series with long-period tidal observations obtained at principal tidal stations of the Survey. In designing this instrument, the main objects sought were ease of installation and minimum size, commensurate with the desired accuracy in the resulting record of the rise and fall of the tides.

*General Description*—The essential features of the gage are its small size, its single drum (*b*) in the illustration—on which the paper record is fastened by means of a spring clip, a single clock movement installed within the drum, a cast base with sleeve (*c*) to fit on top of a float tube of stock 3½-in. iron pipe (*d*). This pipe, in addition to serving as a float well, also acts as a support for the instrument, thus obviating the necessity of providing elaborate platform and cumbersome float well. This feature alone renders the gage more adaptable for use by field parties, particularly in remote localities where wharves and docks are not available. Another departure from the usual design of automatic gage is the use of a spring counterpoise instead of counterpoise weights for taking up the slack of the float wire on a rising tide.

The gage is 10 in. square on the base and, with its weatherproof metal cover in place, is 10 in. high. The gage base locks by means of two hook screws (*e*) into the top section of the float well. This top section (*d*) of the float well is furnished with the instrument; the remainder of the well, since it is stock pipe, may be purchased in the field from local dealers. The weatherproof cover is locked in place by two padlocks, so that the mechanism is completely covered and cannot be tampered with when the gage is installed in exposed places.

*Recording Device*—The drum on which the paper record is wound is a single cylinder 7 in. long and 19.2 in. in circumference. This drum is geared to a clock movement carried within the drum, so as to rotate once in 48 hours, giving a time co-ordinate of 0.4 in. to the hour. Upon clamping the milled-nut (*a*), the drum may be freely turned and the pencil set on the cross-section marigraph paper to the nearest ten minutes of the time co-ordinate of this specially printed cross-

# From Job and Office

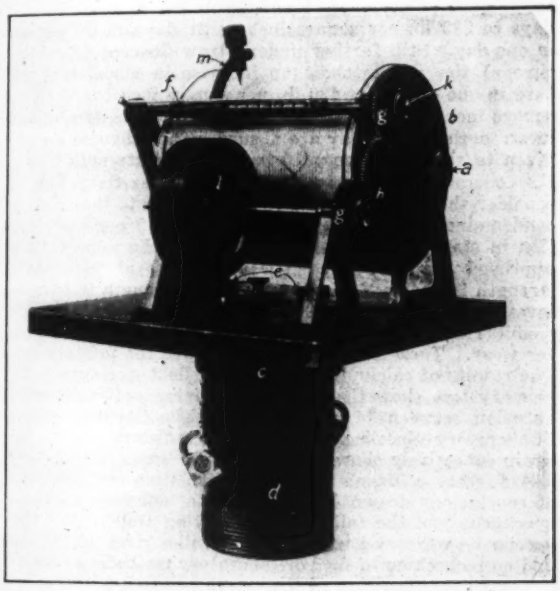
## *For Contractor and Engineer*

section paper. A tangent screw (added after photograph was taken) on the pencil arm (*m*) permits of setting the pencil to the nearest minute.

The tidal graph is made on a special cross-section paper furnished with the gage. The record paper is wrapped around the cylinder and held in place by a metal clip, running lengthwise of the drum. The use of five different scales of cross-section paper permits the reproduction of tidal graphs to five reduced scales, allowing, therefore, for the accommodation to suitable scales of ranges of tide from 0 to 25 ft. The scales as printed for this gage are as follows:

| | | | | | |
|---|---|---|---|---|---|
| 1:11½ | for a | maximum | tide | of | 6 ft. |
| 1:16⅞ | " | " | " | " | 9½ ft. |
| 1:22½ | " | " | " | " | 12½ ft. |
| 1:30 | " | " | " | " | 17 ft. |
| 1:45 | " | " | " | " | 25 ft. |

The change from one scale to another is accomplished by changing the relation between the upper and lower gear wheels (*gg*), the middle one (*h*) being an idler




PORTABLE AUTOMATIC TIDE GAGE

gear. Several sets of these gear wheels are furnished with each instrument.

The pencil screw—(*f*), made of phosphor bronze is connected to the axle of the float pulley (*l*) by means of two gear wheels (*gg*) and an idler gear wheel (*h*).

For adjusting the pencil, when installing the gage, to the height of the tide as read on a fixed graduated tide staff, the milled nut (*k*), holding the upper gear wheel to the pencil screw, is unclamped and the pencil screw then turned freely without connection to the float pulley until the pencil point indicates on the cross-section paper record the height of the tide at that particular time on the graduated fixed staff. This milled nut is then clamped and the penciled curve will thereafter indicate on the record the reading at any instant of the water level on the fixed tide staff as the tide rises and falls.

The clock is an ordinary eight-day movement, mounted within the drum (*b*) which carries the paper record. The gage, when properly adjusted, will operate for eight days without attention in the meantime. The drum turns once in two days; and, since the lunar and solar days are of different lengths, the tidal curve advances sufficiently from one turn of the drum to the next to obviate any interference of the curve for one day with that of the second day following.

*Counterpoise Spring and Float*—Instead of employing the usual counterpoise weight for taking up the slack of the float wire on a rising tide, a coiled flat spring 18 ft. long, is used. This spring is coiled within the case of the float wire pulley (*l*), one end fastened to the inside of the outer periphery of the metal case, the other end fastened to a separate extension of the pulley axle. This subsidiary axle, extending from the float pulley (*l*) in a direction opposite to the gear wheels, is controlled by a ratchet and pawl, so that any desired tension may be put on the spring.

The float, a hollow brass cylinder 3¼ in. in diameter and 15 in. long, connects the water level to the mechanism by means of a phosphor bronze wire. This float is weighted with shot to float in kerosene oil with its upper end ½ in. above the surface, the oil preventing freezing of the water in the float well in winter. The weight of the float and shot is sufficient to wind the counterpoise spring on a falling tide and at the same time to actuate the recording pencil uniformly.

The float pipe consists of a section, or sections, of ordinary stock galvanized 3½-in. iron pipe. A special bronze base-casting is furnished with the gage, having an inverted cone cast inside. A ¼-in. or a ⅜-in. hole drilled at the bottom of this inverted cone allows ingress and egress of the tide to the float well.

When it is necessary to install the gage in a place at which no wharf or platform is available and to have the float pipe carry the weight of the gage as a standard, another length of pipe is screwed into this cone casting on its bottom end and perforated with a number of large holes to allow free access of the water.

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**Records Which Should be Kept** at a water-works plant should show all facts relating to the operation of the plant—not merely financial items but also an inventory of plant equipment, a record of the amount of water furnished to the distribution system each day, amount of power used per plans of the distribution system, all changes in the distribution system, installation and removal of meters, meter testing, quantities of chemicals used for treatment, data concerning treatment and the results of the examination of all samples of water which are analyzed to determine the quality. The records should enable the superintendent to operate the water-works plant in the most efficient manner. If the plant is not operated continuously a study of the operating records should show at what times and for how long a period the plant can be most economically run. Variations in quantity of water available at the source of supply and the variation in ordinary demand together with the effect of fire demand should be shown, as well as the effect of the seasons both on the quantity and quality of water and on the plant and distribution system. Some old operators know these things but such information cannot be as reliable as the written record, and the new man coming onto the job does not inherit his predecessor's memory.—*Prof. Earle L. Waterman at Iowa Section Meeting, American Water Works Association.*

# Letters to the Editor

*This department aims to be a forum for the discussion of the views of engineers and contractors. The range of interest should be as wide as possible. Contributors are, therefore, asked to make their letters short.*

## Should Swimming Pools Be Emptied in Winter?

Sir—We would like to know the best practice of leaving a concrete swimming pool during the winter in this vicinity where the frost strikes into the ground to a depth of 4 to 5 ft.; that is, should the tank be left full of water, so that expansion of the ice will counteract the expansion of the surrounding earth, or is it considered better to leave the tank empty during the winter season?

ADAMS & RUXTON CONSTRUCTION CO.

Springfield, Mass.,
Nov. 10, 1923.

[So far as our experience goes pools are always emptied in winter, but if there is experience to the contrary we would be glad to put it on record.—EDITOR.]

## "What Is the Matter With Reclamation?"

Sir—To the reclamation settlers the reply to the editorial query, "What Is the Matter with Reclamation," raised in your issue of Oct. 25, p. 665, seems a very simple one. After 21 years there is not a project upon which the construction debts, first crediting all payments which have been made, are not greater than they were before payments began, or when original contracts were made. Always under the same direction and control, the settlers have steadily sunk farther and farther in debt, in spite of payments.

To them the basic problem seems to be not engineering, not political, although related to and complicated by both engineering and politics, but strictly economic. How shall reclamation pay out?

In other words the reclamation settler is in very much the same condition, in contrast to the average farmer, which the little boy complained of to his mother—"Ma, these pants are tighter than my skin." Nonsense, Johnny, there's nothing tighter than your skin." "Yes, Ma, these pants are, I can sit down in my skin, but I can't sit down in these pants!" Our reclamation clothes don't fit us. They were built by engineers and politicians according to preconceived theory and the general opinion seems to be that *we* were made wrong and must be altered to fit them. If we lose a toe or finger, arm or leg in the process or have rather frequent funerals, that is only what is naturally to be expected and should not cause protest, or repudiation of what we never were consulted about, because the Civil Service Commission and the American Society of Civil Engineers have O.K.'d the architects and approved the patterns, and the only other side of the question is politics!

We have the right, as one distinguished engineer stated briefly and emphatically a few years since, "only to pray and pay." If we criticise, we will start against us "the influence of the most powerful engineering organization in the world." Is this true?

Reclamation settlers have seldom been able to feel that the engineers in the service as a class and as an organization take a human, or often even a humane, interest in our personal problems and welfare. Due chiefly to this fact we feel they are not properly qualified to direct to ultimate success a problem so complicated with the human element as reclamation, in contrast to strict engineering. This feeling seems to be justified both by the condition of the reclamation fund and by the present trend of the discussion of the problem by engineering societies and journals; as if the technical and not the human factor is paramount, and entirely ignoring the settlers' wishes or opinions.

It is on the human and economic side that reclamation is failing, so that the fund has ceased to revolve, and it is upon this ground that Secretary Work's action must be studied and sustained or condemned.

The very able series of articles upon reclamation now running in *Engineering News-Record* will fail to properly enlighten your readers to answer your own question unless you also present the settlers' viewpoint.

Carlsbad, N. M. Nov. 15, 1923. FRANCIS G. TRACY,
President, Pecos Water Users' Association.

## Effect of Curing Methods on Concrete Roads

Sir—In *Engineering News-Record*, Sept. 20, p. 466, there appeared an article on "Effect of Curing Methods on Concrete Roads" by H. J. Kuelling, construction engineer of the Wisconsin Highway Commission. This article is an instructive and valuable one but I do not believe the results of tests reported warrant the conclusions drawn.

This is especially so in the following paragraph of the report: "In both the field-made and laboratory specimens cured by calcium chloride, the modulus of rupture dropped considerably at 21 days. Because of this rather startling defect some studied consideration should be made before the acceptance of this material as a curing agent."

From the table of this report, which is on page 467, you may observe that in the field specimens cured by calcium chloride the modulus of rupture decreases from 686 lb. per square inch at 14 days to 623 lb. per square inch at 21 days, or 9 per cent in seven days. In the same table under Hay Covered (Field Specimens) the record shows the modulus of rupture decreases from 418 lb. per square inch at 20 days to 333 lb. per square inch at 21 days, or 20 per cent in one day. Still further under Straw Covered (Field Specimens) the results show an increase in modulus of rupture in one day from 420 lb. per square inch to 505 lb. per square inch, or 17 per cent increase. Such losses and gains in strength for one day are absurd. These figures are only given to show the non-uniformity of the strength tests of the concrete after receiving an initial wear test. I do not consider that one should draw conclusions to the extent of condemning a curing agent that shows a 9 per cent variation in strength in seven days when in the same table an approved curing agent shows 20 per cent variation in strength in one day. Furthermore the strength tests in this investigation can be classed only as secondary tests as the modulus of rupture specimens had previously been tested for wear. Therefore, the wear tests are the primary tests. The results of calcium chloride cured field specimens in this primary test show that there is an increased resistance to abrasion between 14 and 21 days. The Calcium Chloride (Laboratory Specimens) show contradictory results, but again collectively showing less wear in time.

A further criticism of this investigation and the extent of conclusions drawn is the lack of a sufficient number of specimens and the failure of rechecking tests. Only three specimens were averaged for each value given in the table and no rechecking of field or laboratory methods is noted.

The Illinois Division of Highways has tested to date over 900 specimens cured by calcium chloride and has not noted any retrogression in strength. Eight hundred of these specimens have been tested for modulus of rupture strength.

Springfield, Ill. H. F. CLEMMER,
Oct. 23, 1923. Engineer of Materials,
Illinois Division of Highways.

[Copy of the preceding communication was forwarded to Mr. Kuelling whose reply follows.]

Sir—The writer realizes that the number of specimens covered in the table was more or less limited, but the fact that in every case the calcium chloride specimens showed a decrease, both as to modulus of rupture and as to compression, is, in his judgment, a danger sign and worthy of consideration.

In contradiction to Mr. Clemmer, it should be borne in mind that the cylinders were not subjected to abrasions before compression and are true results. His criticism of

the abrasion tests on the slabs is true, but nevertheless they are comparative as all specimens were subjected to the same treatment.

His criticism of the change in strength over one day periods is, of course, just, but the writer still believes that the results warrant the conclusions as given.

Madison, Wis., Nov. 8, 1923.

H. J. KUELLING,
Construction Engineer,
Wisconsin Highway Commission.

## Dealers' Profits on Cement to Large Users

Sir—Referring to Mr. Cormack's letter in your Oct. 25 issue, p. 592, defending the cement supply man, it is astounding to find how little even those who are employed to look after the interests of so great an organization as "The National Builders Supply Association," and others intimately associated with the marketing of cement, really know—or rather profess to know—about the ramifications of the business which they are guiding and counseling.

Mr. Cormack intimates that I am quoting ancient history in the incident I mention bearing on the "spread" between the mill and the consumer. I beg to assure him that in September of 1923 I was quoted cement by two reputable dealers at a price 76c. per barrel higher than I had been paying for it for county use—buying through the regular channels—and that on the same day rather than lose the business these dealers met the price I demanded, and one of them conceded another 10c. per barrel when he found that I was willing to go to the plant for the cement. There was no difference to me as to whether I took the cement from a car or from the mill, and 10c. per barrel was worth saving. So Neosho County—hat in hand—and with the dealer's order, went to the plant and secured her cement—and paid her tribute. But she had saved from the rapacity of members of the National Builders Supply Association the tidy little sum of $324 on a mere bagatelle of 400 bbl. of cement.

No one expects these men to do business with the county or any other unit or individual at a loss; they are entitled to a living profit from their business, and no one suspects that they lost any money in the above named transaction; on the other hand they made as they were entitled to make a reasonable profit.

If it is argued that their prices were based on warehouse delivery, I might answer that we are able to unload and store our cement, hauling one mile from side track to our storage at a cost of 6c. per barrel.

That the cement dealer is a necessary factor I freely admit, and for the small consumer he is indispensable. But my letter in your issue of Oct. 4, p. 567, was a plea for the recognition of the larger consumer—whose unit is car lots—who takes his cement from the car, pays the cash, and who gives the dealer no concern as to whether any, or how many, barrels will be spoiled in storage before being disposed of. I fail to see, however, just how, as Mr. Cormack claims, the elimination of the local dealer in these larger transactions would add to the cost of cement. We have demonstrated from our own experience that the closer we get to the mill door the lower to us is the cost of our cement. The local dealer lives from the profits of his business, supports his various "associations" out of his profits, and hedges against the possible loss of stock by adding to the margin of his profits. To claim that the elimination of all these factors of retail cost would cause the price of cement to skyrocket, sounds like a fairy tale, or a "bogy man" story told to scare the children into being good. The children, in this case the consumers, have been good a long time, but they are getting to the truth of the bogy man stories.

Now comes Mr. Brobston, vice-president of the Dexter Portland Cement Co. (*Engineering News-Record*, Nov. 1, 1923, p. 730), with his defense of the cement maker, and giving voice to an earnest disclaimer of any knowledge of any "association" which has to do with the marketing of his product, or the fixing of prices, or the naming of conditions under which it will be furnished.

How short is memory! Only a few weeks ago "The Cement Manufacturers Protective Association," of which Mr. Brobston's concern was a member, was dissolved by Federal Judge Knox, as being inimical to the best interests of the country!

In my letter of Oct. 4 I mentioned a dinner tendered my commissioners and myself by a certain cement producing company, at which there was a full and free discussion of the methods of marketing their product, in which they defended their system of doing business only through the recognized dealer. At the conclusion of that conference the general manager assured us, in the presence of other high officials of the concern, that they would be only too glad to recognize the car lot customer as represented by the counties and cities, but it was a matter in which they could not act alone, it would have to be taken up and worked out through "the association." He had already been to great pains to explain to us just how docile, and harmless and powerless "the association" was, and yet he was afraid to act independently, even in the marketing of his own product!

And in the face of all these outstanding incidents we are solemnly told that no one knows of any association, or agreement, or tacit understanding, or any other such thing which would in any way prejudice the cement producer who chose to market his own product in his own way. The public at large, and the users of cement in particular will believe these statements when they can drive to the mill door and buy their cement without an order from a local, or any other dealer.

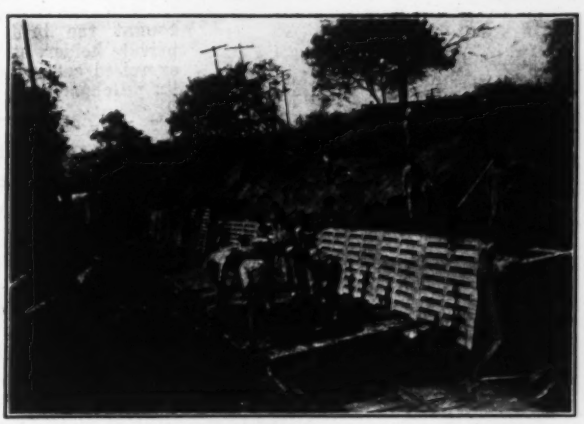
If Mr. Cormack, or Mr. Brobston needs to be given names and places substantiating any of the statements I have made, he has but to write me personally, and I will be glad to go into the particulars of multiplied instances which, however, have no place in these columns

Erie, Kansas, Nov. 6, 1923.

O. T. REECE,
County Engineer, Neosho, County, Kansas.

## Concrete Crib To Prevent Land Slides

Sir—At Utica, Miss., the Illinois Central is using precast concrete cribbing similar to that described in *Engineering News-Record*, Nov. 1, p. 718, to protect against the sliding of the 25-ft.-high hill on either side of the track.



CONCRETE CRIB RETAINING WALL AT UTICA, MISS.

The accompanying view shows a part of the cribbing in place. This design does away with the row of stretchers on the back side of the cribbing, only the headers running back into the hill. However, the cribbing is given a batter of 3:12 instead of 1:12 as in the Rock Island design.

The Illinois Central requires a concrete foundation for the cribbing. On the Utica cut this consists of a curb one foot wide, top even with the base of rail, and deep enough to rest on rock or good foundation material. With this arrangement it is possible to hold the cribbing to perfect alignment and elevation with no danger of any of the sections settling.

KENNETH L. DEBLOIS.

Utica, Miss., Nov. 6, 1923.

# News of the Week

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

## News Brevities

**On Dec. 4, the Civil Service** Commissioners of Colorado, will hold an examination for the purpose of selecting an engineer to fill the position of railway and hydraulic engineer for the state public utilities commission, the place made vacant when C. D. Vail left it to become manager of parks and safety for the city of Denver.

**Reports that the Pennsylvania R.R.** plans to electrify a portion of its system over the Allegheny Mountains, quoted in our last week's issue, is not confirmed. The chief engineer states that no recent consideration has been given to this subject.

**A Chair of Transportation Has Been** established at Yale University in honor of the late Thomas de Witt Cuyler. This action was taken by the Association of Railway Executives at the recent meeting of the American Railway Association. The chair is to be maintained by voluntary subscriptions from individual railroads.

**The National Executive Committee** of Stevens Institute of Technology, the nation's first college of mechanical engineering, announces that the pledges of the first week of their world-wide campaign for a million-dollar endowment total $200,460. This amount includes a contingent gift of $100,000 from Edward S. Harkness.

**Cook County (Ill.) Civil Service Commission** will hold examinations Dec. 6 7, and 8 for civil engineering positions as follows: Inspectors, salary $200, and junior civil engineers, salary, $240. The positions are open to residents of Cook County only. About 35 inspectors and 15 engineers are required, largely to fill positions occupied by temporary appointees.

**The Cascade Power Co. Has Filed** a "declaration of intention" with the Federal Power Commission for a 17,000-hp. development on the Cowlitz River at a point between Portland and Seattle. The project involves the construction of a dam, tunnel and a pipe line. The power will be used for the manufacture of pulp. While the mouth of the Cowlitz River is navigable this development will not come under the jurisdiction of the Federal Power Commission unless it can be shown that it will affect the navigability of the stream.

**Virginia's Highway Program Will** be much curtailed, it is believed, as a result of the defeat recently of the proposed bond issue. An analysis of the situation since the election indicates that the pay-as-you-go advocates have overestimated the revenue which will come from a three-cent tax on gasoline and one mill on general property. It is believed that the aggregate of the revenue from those two sources will be sufficient only to match federal-aid funds.

## Greene to Reduce Personnel in Canal Bureau

According to an announcement made last week Col. Frederick Stuart Greene, state commissioner of public works, has decided upon a reorganization in the Bureau of Canals whereby 100 of the 949 employees are to be dropped from the payroll. By this change Col. Greene hopes to save the state $100,000 yearly, the present payroll of the bureau now being $1,335,852. In the new consolidated Department of Public Works, Col. Greene plans to save the state at least $200,000 a year, the saving being effected in reduction in rents, salaries, and traveling expenses.

## County Liable for Bridge Failure

In a decision filed recently by the Supreme Court, Washington State, Cowlitz County is held liable for damages resulting from the collapse of the Kelso bridge last January, with a heavy loss of life (*Engineering News-Record*, Jan. 11, p. 88; Jan. 25, p. 134). The Supreme Court reverses the decision of Superior Judge Reynolds of the Cowlitz County Court, who dismissed the action, and remands the case for trial.

Cowlitz County contended that the Kelso bridge was solely within the city limits of Kelso and that the county had no jurisdiction over it. The Supreme Court opinion asserts that records show the county and city bought the bridge together from a private holder, and that the county has exercised control over the bridge since its purchase.

## Rivers and Harbors Congress to Be Held Dec. 5-6

The 19th convention of the Rivers and Harbors Congress is to be held in Washington, D. C., Dec. 5 and 6. Though work on the program is not yet entirely complete, the following projects are to be discussed: Cape Cod Canal (speaker to be announced); Port of Los Angeles, John D. Fredericks, Congressman of California; Port of Hampton Roads, Mayor Albert H. Roper, Norfolk; Intracoastal Waterway, C. S. E. Holland, Houston, Tex.; Pittsburgh's three rivers and their connection with Lake Erie, W. H. Stevenson, Pittsburgh. Other speakers will make brief addresses on the various routes proposed for a canal connecting Lake Erie and the Ohio River.

An interesting feature of the convention will be a discussion on the diversion of water through the Chicago sanitary canal and its effect upon the levels of the Great Lakes. Other features will be the Panama Canal, levees and navigation, shallow water assets, and co-ordination of rail and water transportation. The speakers on these subjects include Senator Ransdell, of Louisiana, and Representative W. J. Driver, of Arkansas.

## Many Topics Presented at A.S.M.I. Convention

### Paving, Sewage and Garbage Disposal, Water Supply, Street Lighting, City Planning Reviewed

*Engineering News-Record Staff Report*

Including guests from outside the meeting place about 250 persons attended the 29th convention of the American Society for Municipal Improvements, held in Atlanta, Ga., Nov. 12 to 16. As usual, the program was crowded, but there was more time for discussion than usual. Nearly the whole field of municipal engineering, including city planning and street lighting, was surveyed. Four specifications were passed to letter ballot.

*President Horner's Address*—The advantages that would result from having a full-time secretary was one of the first things mentioned in the presidential address of W. W. Horner, chief engineer, sewers and streets, St. Louis, Mo. Other suggestions made by Mr. Horner were that the committees of the society might go beyond the standardization of specifications and make reports on the merits of new materials; that more attention might be given to contract forms; and that methods of financing local improvements, the cost of which is met by assessments for benefits could well be taken up. It sometimes happens, said Mr. Horner, that the cost of contract work for local improvement is increased 30 per cent because the contractor has to accept tax liens in payment. Co-operation between the A.S.M.I., the Investment Bankers' Association and the Associated General Contractors was proposed by Mr. Horner.

#### Officers Report

On motion of T. C. Hatton, it was voted to appoint a committee of three to co-operate with like committees from the Am. Soc. C.E. and from the Sanitary Engineering Section of the A.P.H.A. in obtaining American representation at the International Sanitary Engineering Congress to be held in London next June in connection with the Empire Exhibition.

*Reports of Officers*—The Executive Committee recommended that the Society endorse the reduction in paving brick and in asphalt standards agreed to by the Simplified Practice Committee of the Department of Commerce and the manufacturers. This was done through the adoption of the report of the Executive Committee. The report of the secretary, C. C. Brown, city engineer, Lakeland, Fla., showed a net membership gain of fourteen for the thirteen months ended Oct. 1, and a total membership on that date of 677, of which 521 are active, 30 affiliates and 126 associates. The debt of the society was reduced by half during the 13 months ended Oct. 1, $200 being paid from ordinary receipts and $500 from the sale of Liberty Bonds. The

time and place of the next convention was referred to the Executive Committee, in accordance with a proposed amendment to the constitution which it was voted to send the letter ballot.

*New Officers*—Ellis R. Dutton, assistant city engineer, Minneapolis, was elected president for 1923-4. Vice-presidents elected are: E. L. Dalton, Dallas, Tex.; T. C. Hatton, Milwaukee; and C. A. Poole, city engineer, Rochester. C. C. Brown, Lakeland, Fla., and Robert Hoffman, Cleveland, Ohio, were re-elected secretary and treasurer, respectively.

*Reports of Standing Committees*—The Committee on Public Safety, Alcide Chaussé, Montreal, chairman, is at work on a building code. The committee, aware of the studies of this subject being made by the Department of Commerce, is giving particular attention to the logical arrangement of a code. The Committee on Public Welfare through its chairman, J. C. Grinnalds, zoning consultant, Baltimore, is giving particular attention to markets, baths and comfort stations. A study of public markets at Baltimore has convinced the committee (1) that stalls should be rented to the users of the stalls only, and that as a rule public markets should be located on the outskirts rather than at the center of the city. H. F. Bascom, a member of the committee, submitted a report on baths and on comfort stations. The latter are more necessary than ever since the eighteenth amendment has closed so many saloons.

### Fuller Makes Report

George W. Fuller, for the Committee on Water Supply, sent a report reviewing the committee work of the A.W.W.A. and outlining current waterworks activities in other fields. The Committee on Street Lighting, through its chairman, Ralph Toensfeldt, Engineering Division of Lighting, St. Louis, Mo., laid stress upon the new system of a symmetrical lighting. E. R. Conant, chairman Committee on Street Paving and Street Design, presented a lengthy report which will be abstracted in a later issue.

*Specifications Passed to Letter Ballot*—Out of a large number of specification committees listed on the program, most either made no report or else merely suggested slight changes. Four specifications, which had been before the association in printed form for some time, were sent to letter ballot: asphalt, stone block, street railway pavement and track construction, and sewers. From the latter, a proposed form of contract was withdrawn in order that it might be made as nearly uniform as possible with other standard contracts to be taken up in the future.

The program called for reports from representatives on committees of other societies. Two or three made program reports and the others did not respond.

*Moving Pictures*—Films to illustrate how Bridgeport, Conn., salvages worn-out pavements were presented by Charles E. Murphy, of the Texas Co., New York City. Some 140,000 sq. yds. of old macadam was scarified, regraded, top dressed with broken stone and treated with asphalt by the penetration method in 140 working days by using, successively, four gangs of men and machines. Five reels called the "Story of Fire-Clay Refractories" were shown. These were the joint production of the U. S. Bureau of Mines and the Laclede-Stacy Co., St. Louis. Moving pictures were used to illustrate papers on street lighting by L. A. S. Wood, of the Westinghouse Electric & Manufacturing Co., South Bend, Ind., and S. C. Rogers, of the General Electric Co., West Lynn, Mass.

## South Street Bridge Opened

The city-built bascule bridge over the Schuylkill River in Philadelphia at South St., was officially opened to traffic Nov. 9. The main structure was completed about a month ago, and the approaches have now been finished. The American Bridge Co. was the contractor, and the work was done under supervision of the Bureau of Surveys.

## New Chicago Terminal Project

A new terminal station fronting on Van Buren St. and extending between LaSalle and Wells Sts., Chicago, is proposed by the New York Central R.R. as a substitute for the LaSalle Station (one block north of the proposed site), the Dearborn Station and the Grand Central Station. But the Chicago & Western Indiana R.R. already has plans for a new Dearborn Station to replace the same three existing stations, and the Baltimorde & Ohio R.R. is understood to have similar plans for combining all the facilities in a new Grand Central Station (see *Engineering News-Record*, Feb. 22 and March 8, pp. 354 and 453). Negotiations between the several railroads and between the railroads and the city will have to determine which one, if any, of the three rival projects should be carried out.

## Steel Bridge to Replace Burned Springfield Structure

The joint committee for Springfield and West Springfield, Mass., on the construction of a new bridge across the Connecticut River to replace the North End Bridge destroyed by fire last September has unanimously decided in favor of an open-deck steel bridge, 1,135 ft. long and 70 ft. wide, estimated to cost $873,000. The J. A. L. Waddell Co., engineers, submitted alternative plans for steel and concrete structures, and the steel bridge was preferred on the score of cost and expedition in building. It is estimated that the bridge can be made ready for use in six or eight months, but this is conditional on prompt approval of the plans by the War Department and necessary legislation by Congress and the Legislature.

Part of the bridge is to rest on the old piers, and the contract will require that that portion, 18 to 20 ft. wide be built first. The roadway will be 54 ft. wide, with an 8-ft. sidewalk on each side. It is proposed to improve the architectural effect with pylons.

Estimates call for $56,000 for electric railway tracks, including metal to carry the rail base, of which the Springfield Street Railway Co. will be called upon to pay about $25,000. They also call for $38,000 to be expended for ducts, this to be borne by the telephone, gas and electric light companies. These items, totalling $63,000, are in addition to the estimated cost of the bridge.

It is hoped that the contract for the bridge may be let by Feb. 1.

## Bascule Counterweight Falls; Drops Bridge

### Counterweight Hanger Members Break While Bridge Is Being Closed—New Structure Planned

A 65-ft. highway bascule bridge over the Lachine Canal, at Ville St. Pierre, near Montreal, failed on Oct. 3 by the breaking of the counterweight hanger members, which dropped the counterweight and the bridge span. The accident occurred while the bridge was being closed. When the free end of the span was yet 20 ft. above the abutment the rear hanger at the upstream side of the counterweight broke through just inside the concrete. The downstream rear hanger then broke and the counterweight swung forward on the two forward hanger members, breaking off one of them and shearing the rivets at the other one. The span fell from a height of about 7 ft. above the abutment. The bridge was built in 1912 by the Dominion Bridge Co. to designs by the Strauss Bascule Bridge Co.

To clear the canal for traffic, the operating link connecting the forward end of the counterweight walking-beam with the top chord of the bridge was cut near its lower end by torches, and the heel pins of the span were withdrawn, permitting the span to be lifted and rolled out of the way longitudinally.

No information about the accident has been obtainable from the Canadian Department of Railways and Canals (W. A. Bowden, Ottawa, chief engineer).

### Strauss Company Issues Statement

The Strauss Bascule Bridge Co. says: "The Lachine Canal bridge was one of the earliest heel trunnion bridges built, having been designed in 1911 while the first of the type was completed in 1910. There existed no specification for bascule bridges such as have now been developed based on experience, and we had not yet developed that perfect co-operation with the fabricator that now obtains. In the early bridges of heel trunnion type steel plates were used for partial support of the counterweight, these plates covering the two entire side surfaces of the counterweight. This detail was long ago abandoned and replaced by embedded members.

"Some five or six years ago these plates were removed from the Lachine Canal bridge without the co-operation of all parties interested and without due regard to the function performed in taking part of the stress involved in the support of counterweight. The result, evidently, was to overload the remaining members connecting the counterweight to the counterweight trusses. In spite of this only half of one of the embedded members failed initially, the character of the fracture showing that this failure was one of long standing and evidencing that the bridge continued to operate even with the overstressed member.

"The Department of Railways and Canals has authorized us to prepare plans for placing the bridge back in service, and we are building into the counterweight our later details, which fully provide for secondary stresses and for reversal of stresses and similar considerations, knowledge of which grew out of our experience with these early designs. The heel trunnion type has now been reduced to standardized design in both theory and practice."

## U. S. Chamber Reports On Transportation

**Recommendations Made Based on Theory Best Service Is Possible Only Through Co-operation**

After a careful study of the recent developments in the transportation situation of this country caused by the great increase in the use of motor transport on paved highways, the Committee on the Relation of Highways and Motor Transport to Other Transportation Agencies of the Chamber of Commerce of the United States has come to the following conclusions:

1. The best interests of the public and the rail, water and motor carriers lie in the co-operation between the various agencies of transportation rather than in wasteful competition; 2, the greatest opportunity for co-operation is at the point where the capacity of the railroads is most limited and expansion is difficult and costly; that is, in the terminal areas of our great cities; 3, store-door delivery by motor transport is the greatest contribution which can be made to the solution of the terminal problem; 4, organized motor transport can also relieve the railroad from various forms of uneconomical service, such as switching between local stations and short-haul shipments within the terminal area;

5. To secure the fullest benefit from this organized motor transport will require the utilization and further development of modern technical equipment, such as demountable bodies, trailers, container cars and mechanical handling appliances; 6, outside of the terminal areas there are distance zones in which one type of carrier, the motor for short haul and the railway or waterway for long haul, is clearly more economical than the other, and intermediate zones in which competition is inevitable; 7, it is to the interest of the public and the carriers that the economic limitations of each type of carrier be recognized, that the railroad be permitted to discontinue unprofitable service to which the motor is better suited, and that the motor abandon its efforts to handle general traffic over excessive distances; 8, to insure to the public continuity and reliability of service, sound financial organization of motor transport is necessary as is public regulation of common-carrier motor service; 9, passenger bus transport should be so regulated as to secure the best service to the public (rail lines can often advantageously extend or supplement their service by bus lines, and any restrictions against such service should be abolished);

10. Regulation of traffic and of size, weight and speed of motor vehicles should be made more uniform within states and the regulation of common carrier operation of motor vehicles, including rate regulation, should be handled by federal or state authorities, under the commissions which now control the operation of rail and water carriers; 11, truck highways in any area should be able to carry the normal vehicular traffic of that area, and, if the traffic economically justifies the use of specially heavy trucks, highways with stronger substations should be provided; and 12, investigations now under way by the U. S. Bureau of Public Roads state and highway departments and other agencies to determine more fully the economic role of the motor vehicle, should be continued.

## A. P. Davis Is Honored By Washington Engineers

Arthur P. Davis, the past president of the American Society of Civil Engineers, who was summarily dismissed as Director of the Reclamation Service by Secretary Work, has been elected to honorary membership by the Washington Society of Engineers. This honor has been conferred on only four others. They are: Commerce Secretary Hoover, Admiral H. T. Endicott, Admiral D. W. Taylor, and Dr. F. H. Newell. Mr. Davis now is in England, representing the Department of State on engineering matters coming before the Pecuniary Claims Commission.

## River Terminal for Cincinnati

A steamer dock on the Ohio River front with warehouse, railway connections and freight-handling equipment is to be built by the Cincinnati River-Rail Transfer Co., and it is expected to have this terminal in operation early in the spring of 1924. The purpose is to provide more efficient and economical handling of river-borne freight than is practicable with the old arrangement of a levee and wharf boats. The company was organized partly as a civic enterprise, backed by the Chamber of Commerce, charges to be regulated by the city and a fee paid to the city for each ton handled or for each vessel. J. A. Pollak, of the Pollak Steel Co., is president; Major Bert L. Baldwin is chief engineer.

## Arizona Governor Fails to Extend Girand State License

*Washington Correspondence*

The governor of Arizona has declined to extend the time of the state license covering the Girand development at Diamond Creek on the Colorado River. Mr. Girand has filed the governor's letter with the Federal Power Commission.

This puts it squarely up to the Federal Power Commission to take action in this case which involves a $90,000,000 transaction. If the Commission refuses to take action before Dec. 26 on the Girand license, it will mean, unless the governor reverses himself, that the Arizona copper companies would no longer be committed and might decide to rely for a longer period on fuel oil. The decision to resort to hydro-electric power was made at a time when the prospect for securing adequate supplies of fuel oil at reasonable prices was not as good as it is at present. Arizona would be the greatest sufferer were the scheme to fall through. For that reason, some are of the opinion that the state executive may change his mind as soon as he is sure the Federal Commission will not grant the Girand license before Dec. 26.

On the other hand, the Federal Commission must face a heavy moral, and possibly a legal responsibility, if through failure to grant a license, Mr. Girand, who has complied with all the conditions of the preliminary permit, should be subjected to great losses.

## Federal Power Commission Issues Third Report

**Plea Made For Settled Public Policy To Have Uniform Application In All States**

Appreciating the desirability of common action in matters of hydro-electric development, the Federal Power Commission, in its third annual report, just made, makes a plea for a settled public policy which will have uniform application in all the states. Only by such a policy can the country be assured of a systematic development of its potential power possibilities into a great interconnected system without expensive reconstruction or unnecessary duplication. The commission advises that legislation which interferes with such a program should be repealed or modified, nor should it be permissible for any utility to draw plans for future extensions except in such manner that interconnections may be effected when feasible.

The commission points out that the ownership and control of water powers by public agencies should be made a policy of all the states as it now is a fundamental policy of federal water-power control. It also emphasizes the fact that values inherent in a public resource developed and used in the performance of an essential public service shall not be capitalized in excess of amount actually expended in acquisition. This policy is being carried out by the commission as far as all sites under its control are concerned, and these sites involve 85 per cent of the total water powers of the United States. If this principle is applied by the states to all structures and equipment erected or used on the site as well as to the power itself, the commission sees simplification of rate adjustment. Public regulation of rates has not been an entire success largely through the fact that public service commissioners have been chosen for their political affiliations only.

### Funds and Personnel Lacking

The commission is now hampered by the lack of sufficient personnel and funds to carry on its work properly. At the present time its personnel is made up of the three departments part of whose work still has to do with the administration of permits issued under the provisions of earlier laws. The commission recommends that the act be modified so that the administration of all projects will come under the Federal Power Commission. Such a change would make available certain funds which other departments of the government are now using for water power investigations which largely duplicate work required by the Federal Power Commission when issuing permits for such projects. The commission lacks an adequate accounting department needed to control accounts in order that they are not padded with capital not actually put into the development.

The Water Power Act provided that the annual license charges should make the commission independent of support from the Treasury, but the greater part of such funds either are not yet available or are absorbed by prior liens upon them. The commission recommends that the act be amended to make these funds available for its use in order that it may obtain sufficient personnel and still be a self-supporting branch of the government.

## Progress on Mississippi Freight Service

**Colonel Ashburn's Report Mainly An Essay on Essentials of River Freight Transportation**

Col. T. Q. Ashburn, Coast Artillery Corps, U. S. A., and chief of the Inland and Coastwise Waterway Service, has just rendered his annual report on the operations of that service, which has charge of the government fleet on the lower Mississippi and the Warrior Rivers. The report is mainly an essay on the essentials of river freight transportation and an explanation of the difficulties of freight operation on the lower Mississippi River where the government since early in the war has been trying to maintain an economic freight service.

Col. Ashburn lays down the following conditions precedent to success of any inland waterway service: (1) A suitable navigable waterway; (2) suitably designed equipment for each particular waterway, which equipment must be determined by experiment; (3) suitable terminals and balanced freight both ways; (4) interchange of freight with the railroads; and (5) equitable division of revenues accruing to both water and rail transportation for a combined haul. He said that none of these five essential elements is present on the upper Mississippi, so that it is not practicable at the present time to attempt government or any other freight operation above St. Louis.

### Conditions Below St. Louis

Below St. Louis conditions are more favorable, but the government operation is difficult because of the lack of certainty on the part of the shipping public as to whether governmental operations may not be suddenly abandoned, the tendency on the part of individuals or communities to brings political pressure to bear upon the operation, and the inability of the government waterway line to finance itself in periods of depression. He, therefore, recommends a semi-public body to conduct the operations of the Mississippi waterway and presents a bill embodying his suggestions. This bill would create a corporation under government control but with private functions, which Col. Ashburn thinks would avoid most of the difficulties of the government operation of the Mississippi waterway.

Col. Ashburn holds that the lower Mississippi operation was successful, although it continues to lose money if the heavy charge of the war-time equipment is carried on the books. The eighteen months ending July, 1923, were particularly hard ones because of the tremendous flood which went down the Mississippi in 1922 and which very seriously affected the operation of any of the barges. The tonnage for the six months preceding the flood was 375,480; for the flood period, 224,206, and for the succeeding six months, 370,909, which, as the Colonel states, tells its own story. The lowest tonnage was due partly to the difficulties of landing and loading at high water, but mainly to the disturbances to the channel caused by the flood.

In figures, the total income on the Mississippi section from Jan. 1, 1922, to July 1, 1923, was $3,504,512.22. The total operating expenses during the same period were $3,961,989.47, of which $432,000 is depreciation. The main loss was, as noted, in the flood period. For the remaining twelve months actual profit was made.

On the Warrior River the losses were "staggering." According to the Colonel's report, this division has been handicapped by the railway opposition, has never had suitable barge equipment or towboat equipment. The average monthly loss on the Warrior River for the fiscal year 1923 was $54,132. Col. Ashburn estimates that with proper equipment on the Warrior River and with proper rates controlling on the railways, the revenue on the Warrior River would have to average $2.46 per ton in order for the operation to break even. At present, average figures for 1923 show an average revenue of $1.68 per ton and an average cost of $3.95 per ton, leaving a deficit of $2.27 per ton.

## Marginal Belt Line to Be Set Up at Port of New York

The Port of New York Authority has announced that the railroad companies having terminals on the New Jersey side of New York harbor have agreed to allocate certain portions of their properties to be used for the Port Authority's marginal railroad No. 13 and have agreed to spend approximately $500,000 for the construction of certain railroad connections and signal systems to make such a belt line effective. The railroads have also agreed to appoint a director of operation for this belt line, who will be selected from among the officers of some railroad not directly interested in the property. Equipment will be supplied by the individual roads.

The Port Authority also announces that its engineers and those of the carriers' operating committee are continuing their studies of the outer belt line with the idea of being in a position to start construction of that railroad in the near future in order to relieve the marginal belt line from much of the interchange business which it now handles to the detriment of the switching along the water front.

## LaDu Recommends Abandoning Black River Canal

State Engineer and Surveyor Dwight B. LaDu, in his annual report to the New York Legislature will urge the submission to the people of a constitutional amendment permitting the abandonment of the Black River canal which extends from Carthage to Rome. Mr. LaDu's position is that the period of usefulness of this section of the old Erie Canal, which has never been a part of the barge canal, is long past, but two or three boats passing through the canal each year. Mr. LaDu said he would also recommend the abandonment of a strip of the old Erie Canal near Buffalo.

The abandonment of the Black River canal will sound the death knell for another barge canal connection with Lake Ontario via Carthage, Watertown and Sackett Harbor, a project which has been advocated for many years. The nearest this proposal came to materialization was in 1913 when legislation was introduced providing for additional bond issues to the amount of $22,000,000, part of which was to be expended for a barge canal over this territory, which proposal failed of passage.

## Engineering Employment Shows Slight Recession

**Numerous Inquiries Being Received—Civil Engineers Hardest Hit—Los Angeles Permits**

Employment conditions affecting engineers reflect considerable irregularity with special divergencies between the trends in different industries and engineering endeavors, but on the whole, engineering employment throughout the country is fair. Numerous inquiries are being received from all sections of the country from men desirous of making new affiliations, or who report the completion of their work, indicating that a slight recession in employment is apparent. These are the observations of E. B. Miller, employment secretary, American Association of Engineers. A fair volume of placements has been accomplished through the Chicago office of the association. The business of October exceeded that of September by 12 per cent. In the latter month there was practically no unemployment among engineers, but during October some unemployment was noticed and it is now increasing slowly. So far, however, most men requiring new positions were able to make connections in a short time which will last at least for the winter months. In the Chicago district more than 300 engineers were laid off during October and early in November 100 engineers had been given notice of discontinuance of their employment during the month.

### Civils Hardest Hit

Civil engineers are hit the hardest at this time, particularly those on construction work, including superintendents, instrument and general field engineers. Practically no demand exists for men on irrigation, drainage, hydraulic or construction work. Manufacturing and industrial companies have reduced their technical staffs although a few lines continue actively, such as machinery, tool, railway equipment and automobile manufacturers. The greatest demand is for architectural engineers and draftsmen. A fair demand is evident for highway engineers, especially designers on plans and bridges. The railroad field for engineers is practically dormant. The electrical industry is fair with a good demand for junior men for minor positions and a fair demand for a few electrical technical experts. The chemical and mining fields have not shown any great changes, but not much unemployment is noted in these two lines.

The greatest number of building permits during October for any city, was issued in Los Angeles, exceeding the building permits for Chicago, which so far this year had held first place. Positions for engineers on the Pacific Coast and Southern California are fair. In the Northwest, conditions are tightening with little work for engineers in the states of Washington, Montana and Idaho. The Middle West is fair for employment and men can find something to do if they are willing to accept what is offered. The Eastern section is not very desirable for employment; more men are looking for positions than there are positions open. The South is starting considerable activity with a good demand for engineers of the junior grade. The greatest unemployment at the present time is in the Northwest and Eastern sections of the country.

## Random Lines

### *Animal Magnetism*

Sir—There are several different ways of finding the points of the compass, but the following, while it is not a new method, is a new one to me. I have clipped it from "Century Readings in American Literature" published by the Century Co. 1923:

"In 1729, William Boyed was a member of the expedition sent to determine the dividing line between Virginia and North Carolina. In his 'The History of the Dividing Line,' 1841, he writes:

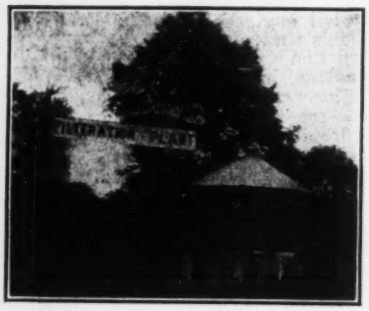
"'He told us a Canterbury Tale of a North Briton whose curiosity spurred him a long way into the Great Desart (The Dismal Swamp) as he called it, near twenty years ago, but he having no compass, not seeing the sun for several days together, wandered about till he was almost famisht; but at last he bethought himself of a secret his Countrymen make use of to pilot themselves in a dark day.

"'He took a fat louse out of his collar, and exposed it to the open day on a piece of white paper which he brought along with him for his journal. The poor insect having no eyelids, turned himself about till he found the darkest part of the heavens, and so made the best of his way toward the North.'"

C. D. P.

* * *

### *Query? Does The Engineer Need a Broader Education*



SIGN ON THE BROADRIPPLE SWIMMING POOL AT INDIANAPOLIS, IND.

* * *

### *The Supply is Getting Low*

We think we have about exhausted the supply of adjectival engineers, because our voluntary scouts are beginning to report duplicates. Two new ones have shown up, though, one bona fide, a "*dehydration engineer*" who advises California farmers how to dry fruits, and one hypothetical, the "*psychic engineer*," who, a certain professional spiritualist claims, is needed today by the world. This latter brother will "spend his time and life, if need be, to the study of high tension and grasping the messages from the other side of life on this side."

* * *

### *Standardized and Replaceable?*

"Engineer To Be Man of Many Parts in Future," says a Cleveland paper in reporting the Carnegie Foundation's new study into engineering education.

## Large Power Development Proposed for Columbia River

The Washington Irrigation & Development Co. has applied to the Federal Power Commission for a license covering its development at Priest Rapids on the Columbia River between Spokane and Portland, and has stated in the application that it will start work immediately upon issuance of a license with the idea of having the first lot of power, amounting to about 200,000 hp., ready for delivery within four years. The development as now proposed calls for the construction of a dam partly of concrete and partly of earth fill 2½ miles long. The power house will be built in the dam, the initial section being 660 ft. long, with a provision for a 700-ft. extension. The spillway section will contain 127 gates 30 ft. long with a flood discharge capacity of 1,200,000 sec.-ft., or almost double the amount of the largest flood on record, which is 710,000 sec.-ft. The head to be developed is 70 ft. The initial installation will be six 40,000-kva. and two 29,000-kva. units, and the additional future installations will be ten 40,000-kva. units. The initial installation will cost approximately $28,000,000 while the project in its final form is expected to represent an outlay of $41,000,000. The dam will be provided with two navigation locks and a fishway.

## George P. Coleman Chief Speaker at Highway Officials Session

Due to the fact that C. J. Bennett, nominal head of the American Association of State Highway Officials, though no longer a highway official, cannot be present at the New Orleans Convention Dec. 3, 4, 5 and 6, the principal address will be delivered by George P. Coleman, of Virginia, the retiring chairman of the Association's executive committee. In that address, Mr. Coleman will review his eleven years' service as a state highway official during which he has been particularly active in connection with federal legislation pertaining to highways.

J. M. Parker, the Governor of Louisiana, and Andrew McShane, the Mayor of New Orleans, will speak at the opening session to welcome the delegates to the Louisiana metropolis.

Arrangements have been made to present during the convention, the new films of the Bureau of Public Roads entitled "Motoring Through Maryland" and "The Changing Road."

In compliance with an invitation from Tulane University and the University of Louisiana, the Association has agreed to arrange with highway engineers to lecture before classes at those universities, during the time that the convention is in session.

Reports will be submitted by the Committee on Standards including subcommittees on plans and surveys, design, specifications, traffic control, bridges and structures; Committee on Administration, and the Committee on Construction.

Besides Mr. Coleman, speakers will be Henry G. Shirley, F. S. Greene, J. H. Mullen, G. W. Hutchinson, Clifford Older and Thomas H. MacDonald.

F. R. White is acting president of the association.

## Coal Commission Urges Profits Tax on Coal Operators

The Coal Commission in its latest report on the profits of anthracite coal operators recommends that a profits tax be applied to the operations of the coal mines. It finds that no sweeping horizontal cut can be made in the price of coal at the mine, or in the margins, without serious injury to many high cost operators whose output is needed. The consumer will benefit indirectly through the lightening of taxes elsewhere. In addition the commission again recommends requiring complete publicity of the operators' accounts and urges the public to resort to the use of substitutes in order to protect itself against unreasonable profits.

These recommendations are based on a study of the coal operators' margins, which study shows that these margins range from nothing to over $2 per ton, and that the per cent return on the book value of the investment ranges all the way from a loss to a return of 138 per cent. The book values have had very large increments in recent years and are largely shrouded in mystery but there is ample evidence of certain "write-up" amounting to at least $186,000,000 and in addition there were memorandum accounts kept for Federal tax purposes indicating further appreciation of $40,000,000. These however are 1913 figures and if the valuation of $989,000,000 placed on the mines and minerals by the commission's engineers are to be taken as correct there will be much greater increases because the owners book valuation is now only $600,000,000.

The commission finds that the practice of carrying large reserves of coal lands adds to the cost through taxes and conceals profits. The largest of the railroad coal companies, the Philadelphia & Reading, a high operating cost company, has sufficient reserves to last 200 years. On this total investment it has shown an inadequate return, the loss having been made up out of the earnings of the affiliated railroad. The commission calls especial attention to the matter of the increasing value of these reserve coal lands, both for anthracite and bituminous coal, and points out that if it is allowed to continue indefinitely, piling up carrying charges to be added to the current price of coal an intolerable burden will be laid on the consumer. Taxes and interest on coal not to be mined in the next forty years are not properly chargeable to present operations.

## St. John Opens New Drydock

The new drydock of the St. John Drydock and Shipbuilding Co. at St. John, N. B., has been opened with a formal ceremony by the governor-general of Canada, Lord Byng. The new dock, according to its owners, is the largest of its kind in the world. Its extreme length is 1,225 ft. and the length on the block is 1,150 ft., and it is so arranged that it can be used as two drydocks, one 650 ft. long and the other 500 ft. long. The patent slipway is 720 ft. long, and the cradle 240 ft. The depth of the sill at high tide is 42 ft. and the draft of the keel block at extreme high tide is 14 ft. The dock is equipped with a 70-ton fixed crane and a 20-ton traveling crane.

## Engineering Societies

### Calendar

**Annual Meetings**

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Washington, D. C.: Annual Convention, New Orleans, La., Dec. 3-6, 1923.

FEDERATED AMERICAN ENGINEERING SOCIETIES. Washington, D. C.; Annual Meeting, Washington, D. C., Jan. 10-11, 1924.

AMERICAN ROADBUILDERS' ASSOCIATION, New York City; Annual Convention, Chicago, Jan. 14-18, 1924.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; Annual Meeting, New York, Jan. 16-18, 1924.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, Washington, D. C.; Annual Meeting, Chicago, Ill., Jan. 21-24, 1924.

AMERICAN CONCRETE INSTITUTE, Detroit, Mich. Annual Meeting (20th anniversary), Chicago, Ill., Feb. 25-28, 1924.

**The Engineering Society of Western Massachusetts** at its meeting Nov. 20 in Springfield, Mass., was addressed by Charles E. Wells, consulting civil engineer of North Adams, Mass., on the "History of the Hoosac Tunnel," and by Col. B. A. Franklin, head of the Bridgeport Division of the Ordinance Department, on the subject, "If the United States Were Again Forced to Fight Would She Be Prepared?"

**The Engineers' Club of St. Louis** discussed the question, "How Engineering Leadership Can Reduce Seasonal Unemployment" at its meetin · of Nov. 9, with A. P. Greensfelder, secretary of the Fruin-Colnon Contracting Co., St. Louis, and E. A. Hadley, chief engineer of the Missouri Pacific R.R. Co., St. Louis, as the principal speakers.

## Personal Notes

MICHAEL C. HINDERLIDER, consulting civil engineer, Denver, Colo., has been appointed state engineer for Colorado to fill the vacancy caused by the resignation of A. J. McCune. Mr. Hinderlider is a native of Indiana and a graduate of Purdue University. He went to Colorado in 1900 and was soon appointed engineer of the Denver Board of Public Works. From 1902 to 1908 he was engineer in charge of hydraulic work for the U. S. Reclamation Service in the Rocky Mountain Division, embracing seven states. Later he was engineer in charge of construction of the hydro-electric power plant at Shoshone Falls, Colo. Since 1909 he has been in private practice and has designed irrigation systems and earth and masonry dams.

DR. D. B. STEINMAN sails Dec. 4 on a four-months' trip to Sydney, Australia, where he will submit plans which he has been retained to prepare, in partnership with Holton D. Robinson, for the $30,000,000 Sydney harbor bridge.

STEPHEN T. DE LA MATER, chief of the amortization section, income tax unit, Bureau of Internal Revenue, Washington, D. C., has resigned and will return to private practice as consulting engineer with offices in the Insurance Bldg., Washington, D. C., specializing in problems of taxation, operation and valuation as related to construction.

COL. W. J. BARDEN, Corps of Engineers, U. S. Army, was the honor guest and principal speaker at a recent joint meeting of the Seattle Section, American Society of Civil Engineers, and the American Society of Military Engineers at the Engineers Club, Seattle. Col. Barden spoke on "The Muscle Shoals Power Development," of which work he had charge for three years.

DANA PIERCE, first vice-president of Underwriters Laboratories, in charge of the New York office, and an electrical engineer, has been elected president succeeding William H. Merrill, whose death was noted recently in these columns. R. R. SMALL, one of the vice-presidents, has been elected first vice-president.

H. V. KNOUSE, construction engineer, Metropolitan Utilities District, Omaha, Neb., has taken charge temporarily of the operation of the pumping station at Florence, a position held until recently by A. B. Hunt, superintendent. Mr. Hunt, who has been an employee of the water-works for more than forty years, was relieved of the above duties following an investigation by the directors of the district into the responsibility for a deluge of mud which the city experienced in August. Mr. Hunt is still retained on the payroll.

JOSEPH A. MARTIN, former commissioner of public works for the city of Detroit, under whose direction a large part of Detroit's extensive public improvement program including the $25,000,000 sewer system was carried out, was elected city councilman in Detroit at the Nov. 6 election, and having received the highest number of votes of the nine members elected, will become president of the council.

ELISHA LEE, who is at present vice-president of the eastern region of the Pennsylvania R.R., has been appointed vice-president of the central region, succeeding Col. James A. McCrea, who died Oct. 17. Mr. Lee has been in the service of the Pennsylvania R.R. since 1892. During government control of the railroads he was federal manager of the Pennsylvania lines east of Pittsburgh and prior to that had been general manager.

CHARLES S. KRICK, who succeeds Elisha Lee as vice-president of the eastern region of the Pennsylvania R.R. system, entered the Pennsylvania service in 1887 as a rodman. He has since worked his way up through the positions of general superintendent, assistant general manager and general manager.

ROBERT V. MASSEY succeeds Charles S. Krick as general manager of the eastern region. He entered the Pennsylvania service in 1892 as an engineer in the construction department and later entered the operating department, becoming a superintendent, general superintendent, and then assistant general manager of the eastern region.

F. P. LARMON, chief engineer, Metropolitan Utilities District, Omaha, Neb., in charge of construction of the new filtration plant, tendered his resignation to Col. Theodore A. Leisen on the latter's assumption of the managership of the district, as noted in these columns last week.

DR. DOUGLAS W. JOHNSON, since 1901 professor of physiography in Columbia University, has been appointed exchange engineering professor to France and will represent seven American universities—Cornell, Harvard, Johns Hopkins, Massachusetts Institute of Technology, Pennsylvania, Yale and Columbia. He will lecture in all the principal French universities on physiography and its applications. Professor Johnson was chief of the division of boundary geography of the American Peace Commission to France.

## Obituary

CHARLES T. HARDING, JR., for the past ten years superintendent of the water-works and the light plant at Virginia, Minn., was drowned in Pelican Lake, Minn., Nov. 1. Previous to 1913 Mr. Harding was associated with the Burns & McDonnell Engineering Co., consulting engineers, Kansas City, Mo.

PERCIVAL WALTER ST. GEORGE, civil engineer, Montreal, died in that city Nov. 12 in his seventy-fourth year. Mr. St. George was born in Scotland and was educated in France and at the University of Edinburgh. He went to Canada in 1866 and for some years was engaged in railroad construction for the Nova Scotia Ry. and Intercolonial Ry. In 1876 he was appointed deputy city surveyor of Montreal and in 1883 became city surveyor, in which position he was noted for his work in flood prevention, drainage and city paving. Since 1900 he had practiced as a consulting engineer. He was one of the original members and a vice-president of the Canadian Society of Civil Engineers.

HORACE R. CARPENTER, assistant chief engineer of the Missouri Pacific R.R., was found dead at the door of his apartment in St. Louis on Nov. 12. Mr. Carpenter, a graduate of Yale, class of 1883, had been with the Missouri Pacific R.R. for eighteen years. Prior to that he served as consulting engineer for various railroads and mining properties. During the world war he was chief engineer for the railroads in Louisiana and Arkansas.

THOMAS R. H. DANIELS, chief civil engineer of the Terre Haute, Indianapolis & Eastern Traction Co., Indianapolis, died of heart disease Nov. 8 after an illness of two days. In 1898 Mr. Daniels was assistant engineer of track and roadway of the Rhode Island Co., Providence, R. I.; and in 1904 became assistant engineer for Westinghouse, Church, Kerr & Co., New York City, in the construction of the new terminal station for the Pennsylvania R.R. Two years later he took charge of the rebuilding of tracks of the United Rys., San Francisco. For some time he was chief engineer for the Birmingham, Ala., Railway, Light and Power Co.

# From the Manufacturer's Point of View

A Point of Contact Between Maker and User of Construction Equipment and Materials

## Tardy Orders for Supplies Upset Building Schedules

**Manufacturers Cannot Always Satisfy Eleventh-Hour Demands of Engineers**

*In the Nov. 8 issue of "Engineering News-Record," p. 783, a manufacturer of waterworks equipment deplored the insufficiency of time usually allowed for preparing estimates or bids on proposed work. Manufacturers of other products used in the construction field were asked for a statement of their experience or an expression of their opinon. Some of the replies follow.*— EDITOR.

### *Steel Doors and Partitions*

BY ERNST DOSCHER
The J. G. Wilson Corp., New York

WE DO not have much cause for complaint because of the shortness of time to submit bids on our products, as it takes but a few moments for us to figure a proposal.

Our chief complaint is that on account of the fact our products (rolling and folding doors and partitions) are about the last things to be installed in a building, contractors delay placing their orders with us until they are almost ready to have the products installed. Our lives are then made miserable by their pounding us for shipping dates.

This is especially true in August and September on school work. Many contractors delay until June or July before they order the partitions and wardrobes that we manufacture and which are required for the opening of schools early in September. This floods our factory with orders and it is impossible to ship in time to meet all demands.

The same thing is true as regards our rolling steel doors used on the exterior of buildings. The contractors wait until the fall before placing their orders and then are in dire need of the doors to protect the building against the weather. We have tried to get them to place their orders well in advance and let us manufacture our products based on sizes which are guaranteed by them, so that there will be no delay when the building has progressed to the point that installation can be made. In this, we are only partly successful.

### *Cement Tile Roofs*

BY L. J. WILHARTZ
Federal Cement Tile Co., Chicago

RELATIVE to the period of time generally allowed for the submission of bids on proposed contracts, in a great many instances we could use additional time in the more careful preparation of our bids. In the main, however, we do not feel that we have a legitimate complaint in our particular line of business. Taking into consideration the pressure under which most business concerns operate today we feel that we are receiving all of the time that we could reasonably ask for.

### *Water Filters and Softeners*

BY GEORGE F. HODKINSON
American Water Softener Co., Philadelphia

WE HAVE noted and heartily indorse the views expressed by C. G. Richardson in his article appearing in your issue of Nov. 8. In many instances the time allowed between date of advertisement and date set for receiving bids is so short it is impossible for us and many others to bid, and this may exclude some low and desirable tenders.

If ample time is allowed, bidders have an opportunity to shop around for prices which might enable them to bid a lower figure than if compelled to make wild guesses. It is often necessary to visit the site of the work, to become acquainted with local labor and other conditions and to get information from the engineers by correspondence, in order to bid intelligently, and this takes time.

Too much publicity cannot be given to this matter, as a reform is urgently needed.

### *Reinforced-Concrete Chimneys*

BY R. A. STEEN
Weber Chimney Co., Chicago

IN OUR line, which is the construction of reinforced-concrete chimneys, probably 50 per cent of the cases offer sufficient time for preparing estimates or bids, which is desirable and which naturally results in a saving to the purchaser if the bidder has an opportunity to check over prices of materials and labor carefully, getting complete data as to working conditions. If in doubt, or if he lacks adequate information to protect himself from contingencies he is compelled to bid higher.

We certainly believe rush preparation of bids results in increased cost. On probably 25 per cent of municipal jobs there is barely sufficient time and on possibly another 25 per cent there is insufficient time to bid properly.

We would call attention to the following practice which we think is not fair to the bidder, although it seems to be coming into vogue: That is the practice of engineers preparing specifications for municipalities and then charging a fee for a copy of the plans and specifications. In some instances a portion of this fee is refunded if the plans are returned, and sometimes not. Of course it is quite proper in some cases to ask for a deposit for plans and specifications, although we think with reputable bidders that this really is unnecessary as the bidder is going to more or less expense in preparing his bid and sending a representative to the letting, and he certainly should not be asked to pay for copies of specifications.

Another hardship on the manufacturer is the unwillingness or failure of municipal authorities to give accurate information to the bidder as to when the actual letting will take place. This practice results in uncertainty and additional expense to the bidders for sending their representatives. In certain instances it is also difficult, after the bids have been considered, to find out who secures the business. Certainly every bidder who puts up his certified check and other necessary expenses should be entitled to full and complete information along these lines.

### *Fire Doors for Elevator Shafts*

BY M. L. EDELMAN
The Peelle Co., Brooklyn, N. Y.

THE shortness of time generally allowed for the preparation of bids, does not effect us materially since the quantities for our products can be quickly ascertained from plans and specifications, and prices made up within a very short period of time.

### *Valves and Hydrants*

BY C. A. ANDERSON
Chapman Valve Manufacturing Co., Indian Orchard, Mass.

MR. C. G. RICHARDSON'S comments are well worth consideration. We have noticed in many cases that too short notice is usually allowed to get in quoted prices. Mr. Richardson is quite correct in saying that the people who lay out work sometimes take months and even years to get it lined up, and then expect the contractor to get his prices in within a very short time.

There are many cases requiring special equipment that one manufacturer may not make and has to purchase outside. Often we have been called upon to name prices on short notice and have had to telephone long distances for information from other manufacturers. In doing this we could not, of course, submit complete details or prints of what we had in mind and it was more or less guesswork getting quotations out. Naturally when prices are made on this basis they are usually high and would be termed approximate, and consequently the customer does not receive competitive prices as would be the case if sufficient time had been allowed to go at the matter in a proper way.

### *Steel Window Walls*

BY A. T. HOGG
Detroit Steel Products Co., Detroit, Mich.

WE have very little complaint to make about lack of time for preparing bids. I think, however, this may be due to the fact that we have a very efficient estimating organization in each of our branch offices and most of our principal agents also are equipped to give this service locally. For this reason our customers never have to wait for plans and specifications to be sent through the home office, as these are always handled locally, except in rare instances.

One of the items of service of which we are most proud, and concerning which we are frequently complimented, is our ability to estimate accurately and get our bids in quickly. We make a particular point of this with contractors and believe that the service is very much appreciated.

## Road Show Space Allotted to 205 Exhibitors

Exhibit space at the Good Roads Show, to be held in the Coliseum, Chicago, Jan. 14-18, was allotted to 205 applicants in the manufacturing and allied fields at a joint meeting in Chicago, Nov. 1 and 2, of the executive committees of the American Road Builders' Association and the Highway Industries Exhibitors' Association and Charles M. Upham, convention and road show manager. The two executive committees were assisted by an advisory committee of six, each representing one of the six main classes of exhibitors.

Requests were filed for more than three and one-half times the main floor space available in the Coliseum. Applications for space in the Annex, the Ball Room, and the Greer Building also were in excess of the available floor area. While of necessity the space allotted to most applicants was less than they desired, the committee points out that due to a re-arrangement of aisles and exhibit areas every exhibitor will have adequate facilities for the display of his products.

## Portland Cement Production

Production of portland cement established a new high record for the month of October when the output of United States mills, according to statistics of producers compiled by Ernest F. Burchard, of the U. S. Geological Survey, totaled 13,350,000 bbl. as compared with 13,109,000 bbl. in September, and 12,287,000 bbl. for October, 1922. Shipments for October of this year also showed a gain over those of the previous month, the respective figures being 14,285,000 bbl. compared with 13,698,000 bbl. Stocks, although diminishing, did not reach the low level of October, 1922.

Production of portland cement for ten months in 1923, amounting to 114,366,000 bbl., has nearly reached the total of 114,789,984 bbl. for the year 1922.

## To Approve Use of Name-Plates for Standard Equipment

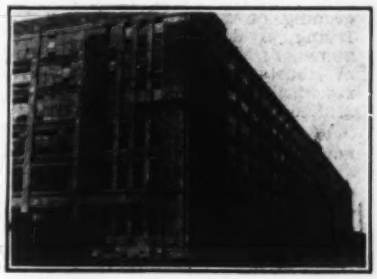
Until the Associated General Contractors' standardization organization is prepared to appoint a committee to test the individual types of concrete mixer equipment made by the various manufacturers with respect to adherence to the adopted requirements, affidavits by manufacturers will be accepted as indicating that equipment is complying with the terms of the coded standards. Upon receipt of each of these affidavits at headquarters, the privilege of using the standard nameplate will be granted.

The plates (see *Engineering News-Record*, Oct. 25, p. 699), will be furnished by the Joint Committee on Construction Equipment, of which Gen. R. C. Marshall, Jr., has been made trustee. The plates will be sold at nominal prices, probably ranging from 35c. to $3.50, the sum being dependent upon the selling price of the equipment on which the plates are to appear. Any profit resulting from this sale of plates will be used by the Joint Committee to further the work of standardization of equipment.

## Counterbalanced Window Sash for Industrial Building

### Installation and Design Details Given for 90,000 Sq.Ft. of Glass in Studebaker Structure

APPROXIMATELY 90,000 sq.ft. of glass and 50,000 pounds of putty were required to glaze 1,681 units of counter-balanced sash and 592 units of sidewall (used in monitors) in the new six-story Studebaker building at South Bend, Ind., erected by G. H. Christman & Co. The installation of this sash, as well as 30 worm and gear operated

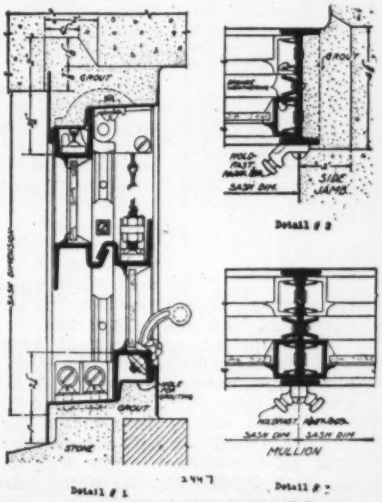


STUDEBAKER BUILDING'S LARGE WINDOW AREA

power units, and 1,552 lin.ft. of pipe was accomplished in 5 months.

Counterbalance sash is more difficult to erect than common factor or sidewall sash because the operation of all moving parts of the former must be accurately adjusted. As a result, the frame members are shipped in knocked-down condition to eliminate chances of their becoming jammed by rough handling in transit. When on the job the frame members are fabricated around the sliding sections, which are shipped assembled and ready for erection. Most of the windows in the Studebaker building were installed in prepared openings after the walls were up, and consisted of large bays, each containing five units of Fenestra sash supplied by the Detroit Steel Products Co., the source of the following notes:

Typical installation details for counterbalance sash are shown in the accompanying drawings. The concrete frame at the head and jambs are built offset with a rebate to accommodate the frame




WINDOW SASH DETAILS

## Japan Awards Lumber Contracts

The Japanese Embassy on Nov. 14 advised the National Lumber Manufacturers' Association that the Japanese Government has awarded contracts for 97,150,000 ft. of lumber for use in building dwellings for Japan's homeless in the area devastated by the earthquake.

The Japanese Embassy said negotiations had been closed with these lumber companies: Douglas Fir Exploitation & Export Co., representing 108 West Coast mills, for 96,400,000 ft. of Douglas fir and Pacific hemlock; and Bratlie Bros. Mill Co., of Ridgefield, Wash., for 750,000 ft. of red cedar. The Embassy said that no information could be given by the Japanese Government at this time concerning the amounts involved in the contracts.

## To Ratify Lumber Standards

"The lumber industry has taken a forward step in its plan for standardization of the industry."

Secretary of Commerce Hoover made this statement Nov. 15, commenting upon a plan submitted to him by the Central Committee on Lumber Standards. Mr. Hoover said he expected ratification of the Standardization plan Dec. 12, at a conference he has called, to be held at Washington, and to be attended by all elements of the lumber industry.

members. It will be noticed that the rebates of the jambs are much larger to allow plenty of room to grout the frames securely in position.

Detail 3 shows the type of mullion generally used when more than one unit is to be inserted in an opening. Bronze weathering sections of flaring channel are inserted at the jambs of the sliding units. These are riveted to the I-beam section in such a manner that they are entirely covered by the equal leg jamb section of the sliding unit. The object of this design is to insure excellent weathering qualities.

Detail 1 shows a typical stone sill and brick curtain wall. Grout is poured into the frame through holes provided for that purpose.

For simple operation with this type of sash the upper and lower sections are hung at the ends of chains which run up over pulleys at the head of the jambs. When the lower unit is pulled up, the upper goes down. The overlapping members of the sash unite, provide effective weathering and prevent wind and rain from driving through.

When installing the sash head and jamb frame members are bolted together and set up in the opening. If mullions are to be used they are attached also at the head. Then the sliding sections are slid up in frame from beneath. The sill member is fastened to the jamb by means of adjustable sill clips, slotted, to allow proper adjustment of the sections and insure sufficient clearance for easy operations.

Glazing is done after the sash has been grouted in. The units are locked tightly shut; bed putty is applied and the panes of glass inserted. Glazing clips for holding the glass securely in place are inserted in the holes provided for them in the muntins. Then the final layer of putty is applied and the job is done.

## Municipal Equipment Shown at Atlanta Convention

**Paving Materials Chief Feature at A.S.M.I. Meeting—Trucks, Sweepers, Pipe and Valves**

EQUIPMENT and materials employed in municipal service were the feature of the exhibit held in connection with the annual convention at Atlanta, last week, of the American Society for Municipal Improvements. Paving materials predominated among the products on display; of 29 manufacturers represented 12 were in the paving field. The following list gives the companies which had exhibits and the nature of their products:

The White Co., Cleveland. Motor trucks in municipal service.

Phoenix Portland Cement Co., Birmingham. Cast urns, samples of raw materials.

Granite Paving Block Association, Boston. Granite blocks.

National Paving Brick Manufacturers' Association, Cleveland. Paving brick.

Portland Cement Association, Atlanta. Pipe, concrete blocks.

Smith-Winn Co., Atlanta. Insurance agents.

Philip Carey Co., Cincinnati. Elastite expansion joints for concrete paving.

Georgia Railway & Power Co.

Atlantic Refining Co., Philadelphia. Asphalt.

Yancey Brothers, Atlanta. Caterpillar tractors and contractors' equipment.

Birmingham Slag Co., Birmingham. Concrete aggregate.

W. S. Goodwin Co., Baltimore. Steel paving guards.

*American City*, New York.

Asphalt Association, New York. Asphalt pavement.

Shearman Concrete Pipe Co., Atlanta. Pipe.

Link Belt Co., Philadelphia. Brush and Brush Mount for Tark sewage screen. Also conveyors.

U. S. Asphalt Refining Co., New York. Azetc asphalt, filler for brick pavement.

Pittsburgh Testing Laboratory, Pittsburgh.

Ludlow Valve Mfg. Co., Atlanta and Troy, N. Y. Valves and hydrants.

*Manufacturers Record*, Baltimore.

Sam E. Finley, Atlanta, Ga. Pavements.

Kentucky Rock Asphalt Co., Louisville. Rock asphalt pavement.

Lock Joint Pipe Co., Ampere, N. J. Concrete pipe.

Catch Basin Products Corp., Indianapolis. Sewerage accessories.

Warren Brothers Co., Boston. Bituminous pavement.

*Public Works*, New York.

Willite Southeast Co., Atlanta. Bituminous pavement.

Elgin Sales Corp., Chicago and New York. Street sweepers, motor driven.

F. W. Sampson, Atlanta, Ga. Vibrolithic pavement.

### Pumps Exported

According to figures issued by the Department of Commerce domestic exports of pumps for the month of September totaled 145 units valued at $63,816. Cuba was the largest purchaser with 28 pumps at $15,691.

## Business Notes

CLEVELAND CRANE & ENGINEERING Co., Canton, Ohio, announces the opening of a new office in St. Louis, Mo.

IRVING IRON WORKS Co., Long Island City, N. Y., manufacturer of subway grating and safety treads for stairways, held a three-day sales convention in New York recently, at which about 40 representatives of the company were present from various cities of the United States and Canada. The speakers at a banquet on the evening of Sept. 12 included W. E. Irving, president; P. L. Price, general manager; M. K. Griggs, representative at Houston, Texas; A. T. Vonier, representative at Milwaukee, and W. McKee, of the production department.

W. & L. E. GURLEY, Troy, N. Y., announce the establishment of an office at 364 Monadnock Block, Chicago, in order to serve mid-west customers more efficiently and expeditiously with their engineering and surveying instruments, plane tables, current meters, water-stage recorders and other appliances. C. H. Smart is in charge.

## Equipment and Materials

### Rotary Pump Delivers Continuous Flow From Deep Wells

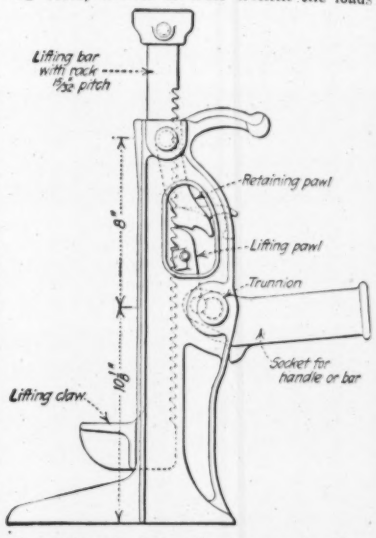
For pumping ground water in connection with irrigation and drainage operations the Worthington Pump & Machinery Corp., New York, has developed the Axiflo deep well pump which, by means of an impeller of the general form of a ship propeller, and discharge vanes delivers a continuous flow claimed to be considerably greater than that obtainable from any other type of deep well pump except the air-lift. The unit is designed for operation within an 18-in. well casing and is driven through vertical shafting by an electric motor or a belt drive from steam or gasoline engine at the ground surface. For shallow wells a single impeller is used, but in deep wells their number is increased, thereby making the pump equivalent to a multi-stage unit.

The impellers are made of bronze. The discharge vanes are designed to eliminate eddying currents and their accompanying waste. The shaft is of nickel steel and is divided into easily handled lengths, coupled together by long steel couplings. The weight of the moving parts and the water column thrust is taken up in specially designed three-plate, self-adjusting bearings, which run submerged in a water-jacketed oil bath.

Three of these deep well pumps were supplied to the Salt River Valley Water Users Association in Arizona for delivery of 4,000 gal. per minute each from 18-in. wells involving lifts of 30 and 40 ft. Tests after installation showed efficiencies as high as 72 per cent, delivering the specified flow.

### A New One-Man Track Jack

A single-acting track jack for operation by one man in surfacing and under normal track loads has been brought out recently by Templeton, Kenly & Co., Chicago, and is known as the No. 217 Simplex jack. A load of only 27 lb. at the end of a 66-in. lining bar inserted in the socket is sufficient to lift 1 ton, so that a 150-lb. man can lift 4½ tons, which is well within the loads




encountered in ordinary work where main track is raised 1½ to 2 in. for surfacing. The total capacity of the jack is 15 tons, so that it is strong enough for such heavy work as raising crossings.

Increased power in the new design is obtained by the use of trunnion, instead of pin, construction for the socket, thus shortening the distance between the bearing and the pawl seat. It was necessary also to reduce slightly the pitch of the lifting rack, but it is stated that while the lift for each stroke is less the jack is more rapid in operation as it works so easily that the operator makes quicker strokes. The total lift is 13 in. All parts except the socket and standard are heat-treated forgings of carbon steel.

## Publications from the Construction Industry

*Power Drag Scrapers*—SAUERMAN BROS., Chicago, has issued a 31-p. illustrated pamphlet on its power drag scrapers, with buckets ranging in capacity from ¾ to 2 cu.yd. The text describes several forms of patented bucket including the Crescent and the LeClair, and then takes up power requirements and handling capacities. Succeeding pages describe both in text and picture the application of the equipment to different kinds of work.